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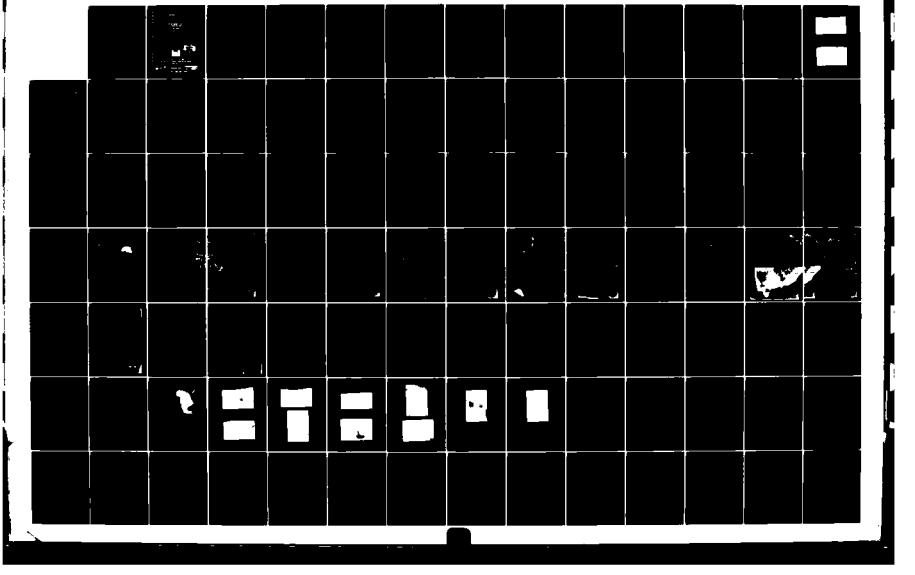

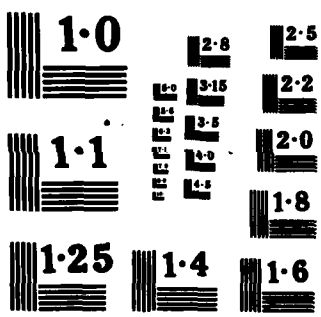
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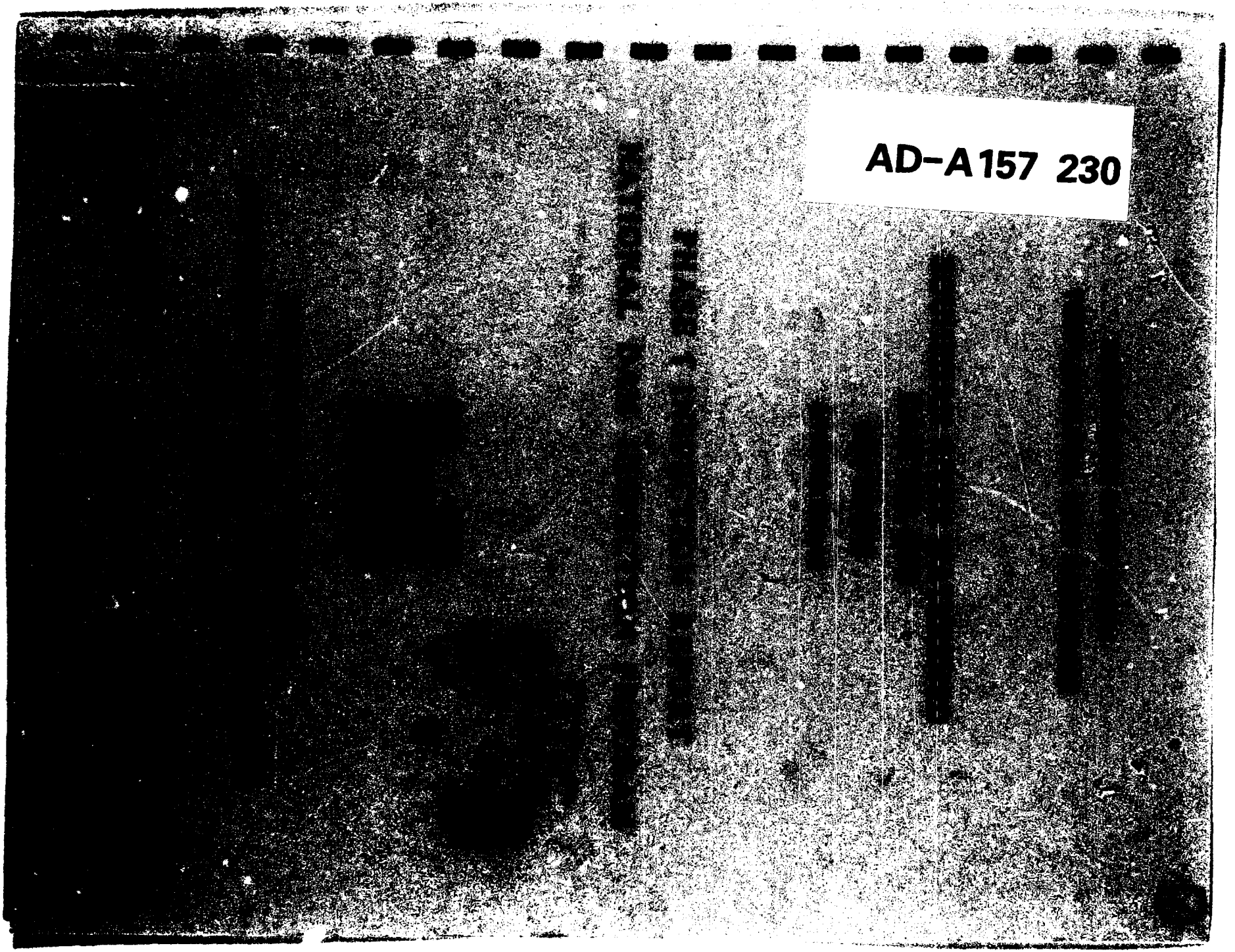

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Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Merrimack River Basin
Temple/Wilton, New Hampshire
Temple Brook (a tributary of Blood Brook, tributary of the Souhegan River)

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The dam is an earth embankment dam 695 ft. long and 69 ft. high. It is intermediate in size with a high hazard potential. The test flood for the dam is the PMF. The dam is in good condition at the present time. There are various remedial measures which should be implemented by the owner. The program of annual technical inspections should be continued. No conditions were observed which require further investigations.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF:
NEDED

DEC 21 1979

Honorable Hugh J. Gallen
Governor of the State of New Hampshire
State House
Concord, New Hampshire 03301

Dear Governor Gallen:

Inclosed is a copy of the Souhegan River Watershed Dam No. 25B Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Water Resources Board, the cooperating agency for the State of New Hampshire and the owner.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Water Resources Board for your cooperation in carrying out this program.

Sincerely,

MAX B. SCHEIDER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

SOUHEGAN RIVER WATERSHED DAM NO. 25B
NH 00476

MERRIMACK RIVER BASIN
HILLSBOROUGH COUNTY, NEW HAMPSHIRE

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

PHASE I REPORT

Identification No.:	NH 00476
NHWRB No.:	234.12
Name of Dam:	SOUHEGAN RIVER WATERSHED DAM NO.25B
Town:	Temple/Wilton
County and State:	Hillsborough County, New Hampshire
Stream:	Temple Brook, a tributary of Blood Brook, which is a tributary of the Souhegan River
Date of Inspection:	May 14, 1979

BRIEF ASSESSMENT

The Souhegan River Watershed Dam No. 25B is located on Temple Brook which is a tributary of Blood Brook approximately 1 mile upstream of the village of West Wilton, New Hampshire. The dam is an earth embankment 695 feet long and 69 feet high with a drop inlet service spillway structure and a 30 inch outlet conduit. An earth emergency spillway 350 feet wide is cut into the right abutment.

The dam is owned by the New Hampshire Water Resources Board. It was designed by the Soil Conservation Service for the purpose of flood protection in the Souhegan River Watershed.

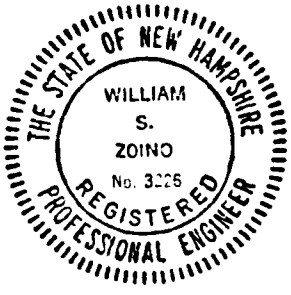
The drainage area of the dam covers 5.4 square miles and is made up primarily of rolling and mountainous woodland. The dam impounds only 38 acre-feet at low stage but has a maximum impoundment of 1623 acre-feet. The dam is INTERMEDIATE in size and its hazard classification is HIGH since significant property damage and loss of life could result in the event of a dam failure.

The test flood for this dam is the Probable Maximum Flood. The peak inflow for this flood is 10,100 cfs. Because of storage, the resulting peak discharge is 9,660 cfs compared to a spillway capacity of 15,482 cfs. The water surface would be at elevation 807.4 feet (MSL) or 1.6 feet below the top of the dam for this flood.

The dam is in GOOD condition at the present time. Remedial measures to be undertaken by the owner include: filling in animal burrows on embankment slopes; mowing of slopes; backfilling tire ruts and erosion holes; providing access to riser conduit; adding annual operation of drain gate to the inspection procedure; and developing a formal written emergency warning system for the dam. The program of annual technical inspections should be continued.

No conditions were observed which require further investigation.

The remedial measures outlined above should be implemented within two years of receipt of this report by the owner.



William S. Zoino
N.H. Registration 3226

Nicholas A. Campagna, Jr.
California Registration 21006

This Phase I Inspection Report on Souhegan River Watershed Dam No. 25B has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

Joseph A. McElroy

JOSEPH A. MCELROY, MEMBER
Foundation & Materials Branch
Engineering Division

Carney M. Terzian

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

Joseph W. Finegan, Jr.

JOSEPH W. FINEGAN, JR., CHAIRMAN
Chief, Reservoir Control Center
Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the Test Flood should not be interpreted as necessarily posing a highly inadequate condition. The Test Flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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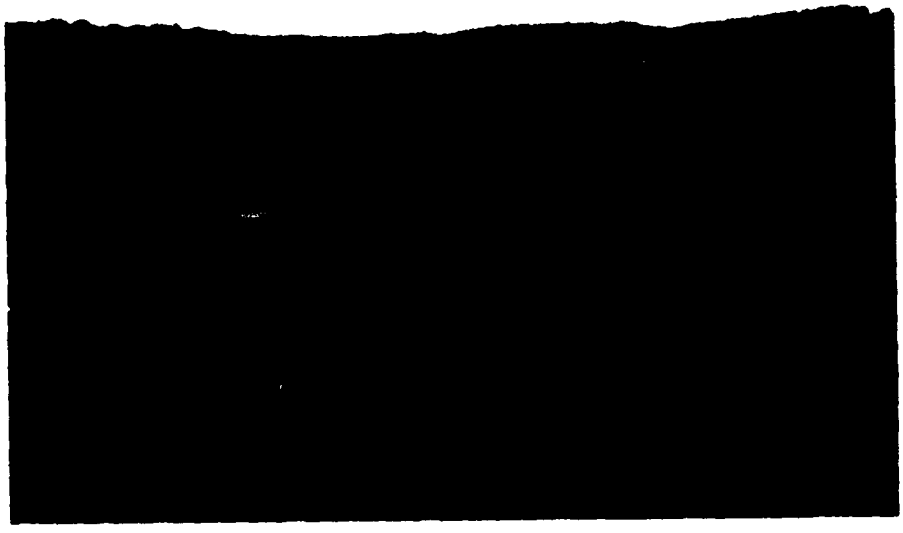


Overview of upstream slope from right abutment

Overview of downstream slope from right abutment

— SCALE —

FROM: USGS PETERBOROUGH - N. H. QUADRANGLE MAP

GOLDBERG, ZOINO, DUNNICLIFF & ASSOC., INC.
GEOTECHNICAL CONSULTANTS
NEWTON UPPER FALLS, MASS.

U.S. ARMY ENGINEER DIV. NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

LOCUS PLAN

SOUHEGAN RIVER WATERSHED
DAM No. 2Sb

NEW HAMPSHIRE

FILE No. 2327

SCALE AS NOTED
DATE MAY 1978

PHASE I INSPECTION REPORT

SOUHEGAN RIVER WATERSHED DAM NO. 25b

SECTION 1

PROJECT INFORMATION

1.1 General

(a) Authority

Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Goldberg, Zoino, Dunnicliff & Associates, Inc. (GZD) has been retained by the New England Division to inspect and report on selected dams in the State of New Hampshire. Authorization and notice to proceed were issued to GZD under a letter of March 30, 1979 from Colonel John P. Chandler, Corps of Engineers. Contract No. DACW 33-79-C-0058 has been assigned by the Corps of Engineers for this work.

(b) Purpose

1) Perform technical inspection and evaluation of non-federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-federal interests.

2) Encourage and prepare the states to initiate quickly effective dam safety programs for non-federal dams.

3) Update, verify, and complete the National Inventory of Dams.

(c) Scope

The program provides for the inspection of non-federal dams in the high hazard potential category based upon location of the dams, and those dams in the significant hazard potential category believed to represent an immediate danger based on condition of the dams.

1.2 Description of Project

(a) Location

The Souhegan River Watershed Dam No. 25B is located on Temple Brook approximately 1 mile upstream of West Wilton, New Hampshire. It can be reached from Temple Road which intersects State Route 101 in West Wilton, New Hampshire. The dam is shown on U.S.G.S. Peterborough, New Hampshire quadrangle with coordinates approximately at N 42° 49.3', W 71° 49.2' (see location map on page v). Page B-2 of Appendix B is a site plan for this dam.

(b) Description of Dam and Appurtenances

The dam consists of an earth embankment with an earthfill cutoff trench below the embankment, a principal spillway with a reinforced concrete riser and outlet pipe, and an emergency spillway located at the right abutment. The length of the dam is 695 feet not including the emergency spillway which is 350 feet wide at the control section.

1) Embankment (See pgs. B-3, B-4, B-5, B-8 & B-10)

The embankment is made up primarily of silty fine sand (Designation SM using the Unified Soil Classification System). It is 695 feet long and is a maximum of 69 feet high. The upstream slope is 3 horizontal to 1 vertical; the downstream slope is 2.5 horizontal to 1 vertical; and the width of the crest is 14 feet.

Beneath the embankment is an earthfill cutoff trench of variable bottom width. According to available plans, it is constructed of the same silty fine sand material as the embankment. The cutoff trench was designed and constructed to extend to firm bedrock or glacial till.

The upstream slope is lined with riprap up to approximately elevation 764.0 (MSL).

2) Principal Spillway (See pgs. B-5, B-7 & B-9)

The principal spillway consists of a reinforced concrete drop inlet structure with a sluice gate controlled inlet pipe and two uncontrolled orifice inlets and a 30 inch outlet pipe supported on a concrete cradle.

The inside dimensions of the riser structure are 40.5 feet high and 7.5 feet wide normal to the axis of the dam. It is 2.5 feet long parallel to the embankment and flares to 14.2 feet long at the top. The walls of the structure are 15 inches thick for the bottom 12 feet, 12 inches thick for the next 5 feet, and 10 inches thick for the top section. The top slab is 8 inches thick. The structure is founded on a 9.2 feet by 12 feet spread footing.

At the base of the structure is a 24 inch diameter, vertical lift, sluice gate inlet which is controlled by a wheel operated bench stand with a rising stem. A 24 inch diameter concrete pressure pipe extends 48 feet upstream from the lift gate into the impoundment pool. Plans indicate a reinforced concrete inlet structure at the upstream end of this pipe which is protected by a trash rack of galvanized steel angles placed on an incline across the opening. The pipe is supported on a 4 inch thick concrete bed.

The "low stage inlet" is an uncontrolled opening approximately 9.25 feet above the sluice gate invert. It is one foot, 10 inches wide and 17 inches high and is located in the upstream face of the riser structure. The water flows over this orifice and drops into the riser structure. It is protected by a trash rack assembly approximately 11 feet high and 4.2 feet wide. This assembly is fabricated from galvanized steel angle sections.

The "high stage inlet" consists of two openings approximately 37 feet above the sluice gate invert. They are 7.5 feet wide and 15 inches high and are located in the left and right sides of the flared portion of the riser structure. They are protected by a galvanized steel grating 2.5 inches high placed in front of each high stage opening and 5 galvanized steel angles placed in the sloping section below each opening. A 30 inch diameter manhole permits access into the riser structure.

The riser structure is drained by a 30 inch diameter reinforced concrete pressure pipe. It is approximately 345 feet long and drops approximately 5 feet over that length. The pipe penetrates the downstream side of the riser structure and is supported by a 7.5 inch thick concrete cradle within the embankment. Plans indicate 4 concrete anti-seep collars cast around the pipe within the embankment.

The downstream end of the conduit and cradle extend approximately 16 feet downstream of the embankment. The cradle is supported by a reinforced concrete tee bent on, a 3 foot square, spread footing. The top flange of this bent is 15 inches thick, 15 inches deep, and 4.75 feet wide. The discharge conduit outlets into a stone revetted plunge pool.

3) Emergency Spillway (See pgs. B-3 and B-6)

The emergency spillway was excavated in earth within the right abutment. It curves to the left around the embankment and is 350 feet wide at the control section. It is approximately 600 feet long and lies approximately 6.5 feet below the top of the embankment. The side slopes are 4 horizontal to 1 vertical.

4) Foundation and Embankment Drainage (See pgs. B-4 and B-8)

A 5 feet wide chimney drain of clean sand and gravel extends the full length of the embankment beneath the upstream slope. It contains a 12 inch perforated metal pipe extending 220 feet to the left of the outlet conduit. This pipe and an outlet pipe for the right side, discharge on either side of the outlet conduit.

(c) Size Classification

The dam's maximum impoundment of 1623 acre-feet and height of 69 feet place it in the INTERMEDIATE size category according to the Corps of Engineers' Recommended Guidelines.

(d) Hazard Potential Classification

The hazard potential classification for this dam is HIGH because of the significant economic losses and high potential for loss of life downstream in the event of dam failure. Section 5 of this report presents more detailed discussion of the hazard potential.

(e) Ownership

The dam is owned by the New Hampshire Water Resources Board, 37 Pleasant Street, Concord, New Hampshire 03301. They can be reached by telephone at area code 603-271-3406.

(f) Operator

The operation of the dam is controlled by the New Hampshire Water Resources Board. Key officials are as follows:

George McGee, Chairman
Vernon Knowlton, Chief Engineer
Donald Rapoza, Assistant Chief Engineer

The Board's telephone number is 603-271-3406. Alternatively, the Board can be reached through the state capital at 603-271-1110.

(g) Purpose of the Dam

The purpose of the dam is to reduce downstream flooding by providing temporary storage for the runoff from 5.4 square miles of watershed. This temporary storage is released through the low and high stage inlets of the principal spillway.

(h) Design and Construction History

The dam was designed by the U.S. Department of Agriculture, Soil Conservation Service in conjunction with the New Hampshire Water Resources Board. It was completed in 1971.

(i) Normal Operating Procedure

The dam is normally self regulating. The pond drain gate is operated only as part of infrequent maintenance checks.

1.3 Pertinent Data

(a) Drainage Area

The drainage area for this dam covers 5.4 square miles. It is made up primarily of rolling and mountainous woodland with some pasture and minor development.

(b) Discharge at Damsite

1) Outlet Works

Normal discharge at the site is through the 30 inch diameter outlet pipe. In the event of severe flooding water would flow over the emergency spillway at elevation 802.5 feet (MSL). The invert of

the low stage orifice is at elevation 760.5 feet (MSL). The invert of the high stage orifice is at elevation 788.5 feet (MSL).

2) Maximum Known Flood

There is no data available for the maximum known flood at this damsite.

3) Ungated Spillway Capacity at Top of Dam

The capacity of the principal spillway with the reservoir at top of dam elevation (809.0 feet MSL) is 146 cfs. The capacity of the emergency spillway is 15,336 cfs at this level.

4) Ungated Spillway Capacity at Test Flood

The capacity of the principal spillway with the reservoir at test flood elevation (807.4 feet MSL) is 144 cfs. The capacity of the emergency spillway is 9,516 cfs at this level.

5) Gated Spillway Capacity at Normal Pool

There are no gated spillways with the exception of the gated pond drain inlet which is normally closed.

6) Gated Spillway Capacity at Test Flood

As previously mentioned, there are no gated spillways.

7) Total Spillway Capacity at Test Flood

The total spillway capacity at test flood elevation (807.4 feet MSL) is 9,660 cfs.

8) Project Discharge at Test Flood

The total project discharge at test flood elevation (807.4 feet MSL) is 9,660 cfs.

(c) Elevation (feet above MSL)

1) Streambed at centerline of dam: 747.0

2) Maximum tailwater: Unknown

3) Upstream portal invert diversion tunnel: Not applicable.

4) Normal pool: 760.5

5) Full flood control pool: 802.5

6) Spillway crest:

a) Pond drain inlet: 751.25

b) Low stage inlet: 760.5

c) High stage inlet: 788.5

d) Emergency spillway: 802.5

7) Design surcharge: 806.0

8) Top dam: 809.0

9) Test flood design surcharge: 807.4

(d) Reservoir

1) Length of maximum pool: 4200 ± ft.

2) Length of normal pool: 1200 ± ft.

3) Length of flood control pool: 3300 ± ft.

(e) Storage (acre-feet)

1) Normal pool: 38

2) Flood control pool: 1194

3) Spillway crest pool:

a) Low stage inlet: 38

b) High stage inlet: 538

c) Emergency spillway: 1194

4) Top of dam: 1623

5) Test flood pool: 1521

(f) Reservoir Surface (acres)

1) Normal pool: 6.4

2) Flood control pool: 62

3) Spillway crest pool:

a) Low stage inlet: 6.4

b) High stage inlet: 33

c) Emergency spillway: 62

4) Test flood: 74

5) Top of dam: 78

(g) Dam

1) Type: Earth embankment

2) Length: 695 ft.

3) Height: 69 ft.

4) Top width: 14 ft.

5) Side slopes: Upstream: 3 to 1
Downstream: 2.5 to 1

6) Zoning: Core of semipervious silty sand with exterior shells of gravelly silty sand. There is a chimney drain downstream of the core.

7) Impervious core: Semi pervious, silty sand

8) Cutoff: Variable width, earthfill

9) Grout curtain: None

(h) Diversion and Regulating Tunnel

Not applicable

(i) Spillways

1) Type:

a) Principal spillway: Reinforced concrete Drop inlet

b) Emergency spillway: Grass covered earth channel cut in right abutment

2) Length of weir:

a) Pond drain inlet: 24 inch diameter pipe

b) Low stage inlet: 1.83 ft.

c) High stage inlet: 15 ft.

d) Emergency spillway: 350 ft.

3) Crest Elevation (ft. above MSL)

a) Pond drain inlet: 751.25

b) Low stage inlet: 760.5

c) High stage inlet: 788.5

d) Emergency spillway: 802.5

4) Gates: 24 inch vertical lift sluice gate on pond drain inlet

5) Upstream channel: Reservoir

6) Downstream channel: Narrow channel through gently sloping flood plain

(j) Regulating Outlet

The only regulating outlet is a 24 inch diameter pipe controlled by a wheel operated sluice gate. The pipe invert is at elevation 751.25 feet (MSL). The purpose of this outlet is pond drainage, and it is normally closed.

SECTION 2 - ENGINEERING DATA

2.1 Design Data

Among other design data available from the Soil Conservation Service are hydrologic and hydraulic computations, structural computations, a geological report, soil laboratory test results, and stability analysis computations. This information was used extensively in computations presented in Section 5 and Appendix D of this report.

2.2 Construction Data

"As built" plans are available for this dam and show good agreement with the design plans and the visual inspection.

2.3 Operational Data

No operational data is available as the dam is self-regulating.

2.4 Evaluation of Data

(a) Availability

Sufficient data is available to permit an evaluation of the dam when combined with findings of the visual inspection.

(b) Adequacy

There is sufficient design and construction data to permit an assessment of dam safety when combined with the visual inspection, past performance, and sound engineering judgment.

(c) Validity

Since the observations of the inspection team generally confirm the available data, a satisfactory evaluation for validity is indicated.

SECTION 3 - VISUAL INSPECTION

3.1 Findings

(a) General

The Souhegan River Watershed Dam No. 25B is in GOOD condition at the present time.

(b) Dam

1) Earth Embankment (See photos 1, 2 & 5)

Three to five small animal burrows were found in the upstream and downstream slopes of the embankment. The upstream slope is protected by riprap, and is in good condition. There is debris on the upstream slope.

The left toe drain was not discharging and the right toe drain was discharging approximately 2 gallons per minute. The discharge was clear.

2) Emergency Spillway (See photo 3)

The emergency spillway is in good condition with the exception of tire ruts and erosion holes in the downstream end. There are wet spots in the channel but these are caused by natural groundwater or ponded runoff.

(c) Appurtenant Structure

1) Drop Inlet Service Spillway Structure (See photos 1, 8, 9 & 10)

This structure was observed from the embankment since the exterior ladder is too short to allow access to the structure.

The structure is in good condition with no evidence of spalling, cracking, or efflorescence. The mortar rubbed surface finish has been worn away by moisture intrusion and there is some minor localized honeycombing. The sluice gate bench stand is in good condition. The hand wheel has been removed from the site to prevent unauthorized use. The trash racks are in good condition.

2) Pond Drain Inlet Pipe

At the time of inspection the 24 inch pond drain inlet pipe was completely submerged and could not be observed.

3) Outlet Conduit (See photos 4, 5, 6 & 7)

The downstream end of the outlet pipe is in good condition. The right side of the concrete cradle has been subjected to efflorescence over approximately 5% of its surface area. Minor exudation has occurred at this location. There is no evidence of settlement or displacement of the conduit. The tee bent is completely below ground.

(d) Reservoir Area

The shore of the reservoir is generally shallow sloping woodland. It appears stable and in good condition.

(e) Downstream Channel (See photo 4)

The downstream channel is a narrow channel passing over relatively flat flood plain. The channel appears stable and in good condition. Riprap protection of the plunge pool is in good condition.

3.2 Evaluation

The dam and its appurtenances are generally in good condition. The potential problems observed during the visual inspection are listed as follows:

a) Animal burrows in embankment slopes.

b) Debris on upstream slope of embankment and in low stage trash racks of the inlet structure.

c) Tire ruts and erosion holes in emergency spillway channel.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 Procedures

No written operational procedures were disclosed. The dam is normally self regulating.

4.2 Maintenance of Dam

An annual inspection is made jointly by the New Hampshire Water Resources Board and the Soil Conservation Service. Recommendations resulting from this inspection are implemented by the NHWRB.

4.3 Maintenance of Operating Facilities

Operation of the sluice gate for the pond drain inlet is checked approximately once every 4 or 5 years by NHWRB.

4.4 Description of Warning System in Effect

There is no warning system in effect.

4.5 Evaluation

The established operational procedures for this dam are generally satisfactory. Additional emphasis on routine maintenance will assist the owners in assuring the long-term safety of the dam. A formal, written downstream emergency warning system should be developed for this dam.

SECTION 5 - HYDROLOGY/HYDRAULICS

5.1 Evaluation of Features

a) General

Souhegan River Watershed Dam No. 25B is a Soil Conservation Service (SCS) flood control dam on Temple Brook in Temple and Wilton, New Hampshire. The dam is about 1 mile upstream of the village of West Wilton and 3.5 miles upstream of the confluence of Blood Brook and the Souhegan River. The upstream drainage area is 5.4 square miles with rolling to mountainous topography.

The dam itself is a 695 foot long earthen embankment with a grass-lined earth emergency spillway 350 feet wide. The principal spillway consists of 3 orifices located on a concrete riser in the reservoir. Flow from the orifices proceeds under the dam through a reinforced concrete pipe.

b) Design Data

The data sources available for Souhegan River Watershed Dam No. 25B include the Soil Conservation Service's (SCS) "Hydrology and Hydraulics" Design Calculations. These calculations include Storage-Elevation and Stage-Discharge curves for the dam, and the routing of storms of various magnitudes through the reservoir. These calculations are dated 1960 - 1967.

The SCS established the elevation of the low flow outlet (760.5 feet MSL) at the top of the 50-year sediment pool. The elevation of the 2 high stage outlets (788.5 feet MSL) was established at the 10-year flood stage in the reservoir. The emergency spillway crest was set at the 100-year flood stage (802.5 feet MSL), and the dam crest (809 feet MSL) is set by the extent of frost penetration above the design high water level.

Also available for this dam are SCS "Maintenance Checklist" reports on dam inspections dated May 19, 1977 and June 16, 1978.

The Soil Conservation Service Design plans, dated 1969, are also available for this dam.

(c) Experience Data

No records of flow or stage are known to be available for Souhegan River Watershed Dam No. 25B.

(d) Visual Observations

The emergency spillway is a 350 foot wide grass-lined earth channel, with its crest at 802.5 feet MSL and with one side slope 2:1 and one 4:1. Outflow from the emergency spillway does not feed into Temple Brook immediately, but runs through a minor channel before joining Temple Brook about 500 feet downstream. The principal spillway consists of a concrete riser structure in the reservoir with 3 orifices. The flow from these 3 orifices combines in the riser and flows under the dam to Temple Brook through a 30 inch reinforced concrete pipe.

Downstream of the dam Temple Brook runs through 2400 feet of relatively flat terrain. The only development in this reach is a secondary road between Temple and West Wilton which sometimes runs close to the bank.

The next 3200 feet of Temple Brook, to the confluence with Blood Brook, is relatively steep. There is a house on Temple Brook near the confluence, and there are 8 houses near Blood Brook upstream of the confluence.

Below the confluence of Blood and Temple Brooks, Business Highway 101 parallels Blood Brook, which passes 3 houses, a gift shop, and a restaurant before leaving West Wilton.

The next development, 2000 feet downstream of West Wilton, is a house 10 to 15 feet above the streambed. 4000 feet downstream of that house there is an abandoned mill and mill pond, with a house 15 feet above the streambed. Highway 101 parallels Blood Brook in this area.

Below the abandoned mill pond, Blood Brook's flood plain widens somewhat and Highway 101 moves away from the brook in the 4000 feet to the Highway 31 crossing. The bridge has a low chord less than 15 feet above the streambed. There are 3 houses approximately 20 feet above the stream and a junkyard 15 feet up near this crossing.

800 feet downstream of the Highway 31 bridge, Blood Brook enters the Souhegan River. This confluence is about 1 mile upstream of a group of 30 to 40 houses 15 feet above the Souhegan's streambed, and 3 miles upstream of the town of Wilton, New Hampshire.

(e) Test Flood Analysis

The hydrologic conditions of interest in this Phase I investigation are those required to assess the dam's overtopping potential and its ability to safely allow an appropriately large flood to pass. This requires using the discharge and storage characteristics of the structure to evaluate the impact of an appropriately sized Test Flood. The original hydraulic and hydrologic design calculations of the SCS are available for this dam.

Guidelines for establishing a recommended Test Flood based on the size and hazard classification of a dam are specified in the "Recommended Guidelines" of the Corps of Engineers. The impoundment of between 1000 and 50000 acre-feet and the height of less than 100 feet classify this dam as an INTERMEDIATE structure.

The appropriate hazard classification for this dam is HIGH because of the significant economic losses and high potential for loss of life downstream in the event of dam failure. As shown in the Dam Failure Analysis section, the increase in flooding caused by failure would pose a threat to property and lives in the village of West Wilton and at numerous other locations along Blood Brook and the Souhegan River. Other impacts of dam failure include possible damage to heavily traveled roads and to several small roads (see Dam Failure Analysis section).

As shown in Table 3 of the Corps of Engineers' "Recommended Guidelines", the appropriate Test Flood for a dam classified as INTERMEDIATE in size with a HIGH hazard potential would be the probable maximum flood (PMF). As part of their hydraulic and hydrologic design calculations for the dam, the SCS created a "Freeboard Hydrograph" (approximately equivalent to the PMF) and routed it through the reservoir using a storage router. The peak inflow is 10,100 cfs, which is 1870 csm on a 5.4 square mile drainage area.

The SCS peak inflow of 10,100 cfs is the test flood for this dam. The SCS storage routing results in a peak outflow of 9,660 cfs, with the water surface at 807.4 feet MSL, 1.6 feet below the dam crest and 46.9 feet above normal pool.

This analysis assumes the reservoir elevation at 772.2 feet (MSL) at the start of the storm. Drawdown time from the emergency spillway crest to normal pool is 6 days.

(f) Dam Failure Analysis

The peak outflow that would result from the failure of Souhegan River Watershed Dam No. 25B is estimated using the procedure suggested in the Corps of Engineers New England Division's April 1978 "Rule of Thumb Guidelines for Estimating Downstream Dam Failure Hydrographs", as clarified in a December 7, 1978 meeting at the Corps' Waltham office. Normally this procedure is carried out with dam failure assumed to occur when the water surface reaches the top of the dam. In this case, however, the outflow of 15,600 cfs with the water surface at the top of the dam (809 feet MSL) is greater than the Probable Maximum Flood (PMF) routing outflow at the dam. Also, this outflow would create serious flooding downstream prior to dam failure. As a result, dam failure would cause only a small incremental increase to flood damage in this situation. Failure is therefore assumed to occur with the water surface at the SCS Design High Water of 806 feet MSL, 3 feet below the top of the dam.

The discharge to Temple Brook just prior to failure at this elevation is given by the Stage-Discharge curve developed in Appendix D as 5,550 cfs. The tailwater elevation prior to failure at this discharge is assumed to be 747 feet MSL.

For an assumed breach width equal to 40 percent of the dam width at the half-height, the gap in the embankment due to failure would be 210 feet. The resulting increase in flow would be 160,000 cfs or a total flow of about 165,500 cfs.

The first damage center impacted by dam failure flows would be the village of West Wilton at the confluence of Temple and Blood Brook. There is one house on Temple Brook at the confluence, 21 feet above the streambed. Just upstream of the confluence is a bridge with a low chord 20 feet above the streambed.

The pre-failure flow of 5500 cfs would create a stage of 10 feet in the channel. The attenuated peak dam failure flow of 100,300 cfs would create a stage of 28 feet. This would cause 6.7 feet of flooding at the house, and severely overtop the bridge.

On Blood Brook upstream of the confluence, there are a number of houses near the stream which might be flooded by backwater from dam failure flows. One in particular is only 50 feet upstream of the confluence and 8 to 10 feet above the streambed. Seven others range from 8 to 20 feet above the streambed and from 100 to 300 feet upstream of the confluence.

After its confluence with Temple Brook, Blood Brook runs 2000 feet to the end of the town of Wilton. Development in this reach includes 3 houses 10 to 15 feet above the streambed, a gift shop and restaurant 12 feet up, and New Hampshire Highway 101, about 14 feet up.

The pre-failure outflow of 7500 cfs (including an assumed inflow of 2000 cfs from Blood Brook) would create a stage of 13 feet, which would cause slight flooding. The attenuated peak dam failure outflow of 87,200 cfs would create a stage of 27 feet, again causing extreme flooding and a threat of loss of life.

The next damage center is a house 2000 feet downstream of West Wilton and 10 to 15 feet above the streambed. The attenuated peak dam failure outflow of 76,100 cfs would increase the stage from 10 feet to 19 feet at this location, causing flooding at the house and threatening loss of life. New Hampshire Highway 101 would also be flooded in this reach.

The next damage center is a house 15 feet above the streambed near an abandoned mill and mill pond 4000 feet further downstream. The attenuated peak dam failure flow of 59,000 cfs would increase the stage from 12 to 22 feet, causing flooding at the house and threatening loss of life. New Hampshire Highway 101 would also be flooded in this reach.

The next damage center is the vicinity of the Highway 31 bridge across Blood Brook 4000 feet downstream. At this location, there are 3 houses 20 feet above the streambed and a junkyard 15 feet above the streambed. The attenuated peak dam failure outflow of 43,900 cfs would increase the stage from 9 feet to 18 feet, which would cause overtopping of the Highway 31 bridge, and minor flooding at the junkyard.

About 800 feet downstream of the Highway 31 bridge, Blood Brook enters the Souhegan River. The first major development on the Souhegan is a group of 30 to 40 houses on the west bank of the river from 4500 feet to 9000 feet downstream of the mouth of Blood Brook. At the downstream end of this stretch Highway 101 crosses the Souhegan on a bridge with a low chord about 15 feet above the river.

The assumed pre-failure flow of 12,500 cfs in this reach would create 12 feet of flow in the river. The peak dam failure flow would average about 35,000 cfs and increase the stage to about 19 feet. This would cause serious flooding and threaten loss of life at the houses. This stage would also seriouly overtop the Highway 101 bridge.

About 6000 feet downstream of this bridge, the Souhegan River enters Wilton. There are about 10 to 15 houses and factories near the river in this town, and some flooding would occur. Downstream of Wilton the Souhegan travels through about 5 miles of flood plain before entering Milford. Dam failure flow would probably be attenuated in this reach.

The following chart summarizes the downstream impacts of the failure of Souhegan River Watershed Dam No. 25B.

IMPACT OF DAM FAILURE CHART

Location # (see pg. D-36) Appendix D	Location	# of Dwellings	Level Above Streambed (ft)	Flow and Stage		Comments
				Before Failure	After Failure	
-	At dam	-	0	5,550 cfs	165,500 cfs	
1	Confluence, Blood & Temple Brooks	1 8 upstream on Blood Brook	21 8-20	5,550 cfs 10 ft.	100,3000 cfs 28 ft.	Danger of loss of life.
1	West Wilton downstream of confluence	3 houses 1 restaurant 1 gift shop	10-15 12 12	7,500 cfs 13 ft.	87,000 cfs 27 ft.	Danger of loss of life. Also floods Route 101.
2	House, 2000' downstream of Wilton	1	10-15	7,500 cfs 10 ft.	76,100 cfs 19 ft.	Danger of loss of life. Also floods Route 101.
3	House at abandoned mill	1	15	7,500 cfs 12 ft.	59,000 cfs 22 ft.	Danger of loss of life. Also floods Route 101.
4	Highway 31 Bridge	1 junkyard 3 houses	15 20	7,500 cfs 9 ft.	43,900 cfs 18 ft.	Rte. 31 Bridge overtopped.
5	Confluence with Souhegan	-	-	7,500 cfs -	43,900 cfs -	-
	4500-9000' downstream on Souhegan	30-40	15±	12,500 cfs 12 ft.	33,000 - 37,700 cfs 19± ft	Danger of loss of life.
	Wilton	10-15	varies	12,500 cfs -	- -	-

SECTION 6 - STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

(a) Visual Observations

There has been no significant displacement or distress which would warrant the preparation of structural stability calculations.

(b) Design and Construction Data

1) Embankment

Analysis carried out during the design and construction phase included a slope stability analysis by the Swedish circle and infinite slope methods. Based on this analysis a 3 to 1 upstream slope and a 2.5 to 1 downstream slope were utilized.

2) Appurtenances

A review of the structural calculations for the design of the drop inlet service spillway structure and the outlet conduit (principal spillway) revealed that these structures have been designed on the basis of sound engineering.

(c) Operating Records

There are no known operating records for this dam.

(d) Post Construction Changes

There have been no known construction changes since the dam was completed in 1971.

(e) Seismic Stability

The dam is located in seismic zone No. 2 and, in accordance with the recommended Phase I guidelines, does not warrant seismic analysis.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

(a) Condition

The dam and its appurtenances are generally in good condition at the present time.

(b) Adequacy of Information

There is sufficient design and construction data to permit an assessment of dam safety when combined with the visual inspection, past performance, and sound engineering judgment.

(c) Urgency

The remedial measures described herein should be implemented by the owner within two years of receipt of this Phase I Inspection Report.

(d) Need for Additional Investigations

None

7.2 Recommendations

No conditions were observed which warrant further investigation.

7.3 Remedial Measures

It is recommended that the owner institute the following remedial measures:

1) Check the operability of the pond drain inlet gate as part of the annual inspection procedure.

2) Develop a downstream emergency warning system.

3) Maintain the program of annual technical inspections.

4) Provide a means of access to the riser structure during periods of normal flow by ladder extension or suitable alternative. This need not be kept at the site, but it should be available for inspection of the riser.

5) Implement and intensify a program of diligent and periodic maintenance including, but not limited to:

(a) Backfilling tire ruts, erosion holes, and animal burrows with suitable, well tamped soil.

(b) Mowing brush on slopes.

(c) Clearing accumulated debris from embankment slopes and trash racks.

7.4 Alternatives

There are no meaningful alternatives to the above recommendations.

APPENDIX A

VISUAL INSPECTION CHECKLIST

INSPECTION TEAM ORGANIZATION

Date: May 14, 1979

Project: NH 00476
SOUHEGAN RIVER WATERSHED DAM NO. 25B
Temple, New Hampshire
NHWRB 234.12

Weather: Overcast, drizzle, cool

INSPECTION TEAM

Nicholas A. Campagna	Goldberg, Zoino, Dunnicliff & Associates (GZD)	Team Captain
William S. Zoino	GZD	Soils
M. Daniel Gordon	GZD	Soils
Jeffrey M. Hardin	GZD	Soils
Paul Razgha	Andrew Christo Engineers (ACE)	Structures
Carl Razgha	ACE	Structures
Tom Gooch	Resource Analysis, Inc. (RAI)	Hydrology
Robert Fitzgerald	RAI	Hydrology

Owner's Representative Present

Gary Kerr - New Hampshire Water Resources Board

SOUHEGAN RIVER WATERSHED DAM NO. 25B
Temple, New Hampshire

May 14, 1979
NH 00476

CHECK LISTS FOR VISUAL INSPECTION		
AREA EVALUATED	BY	CONDITION & REMARKS
DAM EMBANKMENT		
Crest Elevation	NAC WSE	809 ft (MSL)
Current Pool Elevation		762 ft (MSL)
Maximum Impoundment to Date		Unknown
Surface Cracks		None
Pavement Condition		Not applicable
Movement or Settlement of Crest		None
Lateral Movement		None
Vertical Alignment		Good
Horizontal Alignment		Good
Condition at Abutment and at Concrete Structures		Good
Indications of Movement of Structural Items on Slopes		None
Trepassing on Slopes		Erosion holes at downstream emergency spillway in loose bouldery fill; 3 to 5 rodent holes 4-6" diameter in up and downstream slopes: tire ruts on emergency spillway
Sloughing or Erosion of Slopes of Abutments		None
Rock Slope Protection - Riprap Failures		Upstream slope riprap in good condition
Unusual Movement or Cracking at or Near Toes		None
Unusual Embankment or Downstream Seepage		None
Piping or Boils		None
Foundation Drainage Features		Functioning as below
Toe Drains	NAC WSE	Left toe drain - No flow, right toe drain - 2 gpm
Instrumentation System		None

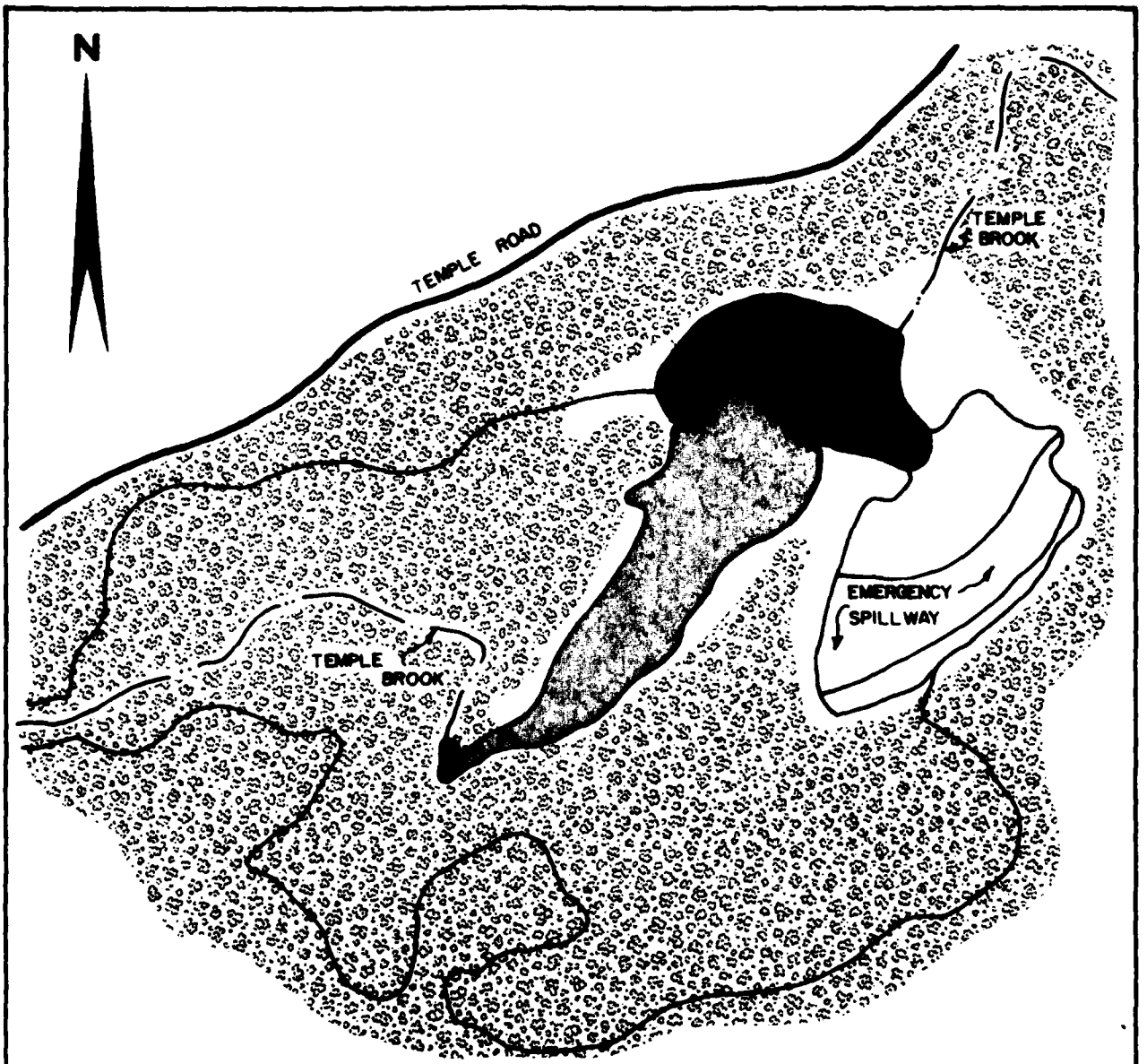
SOUHEGAN RIVER WATERSHED DAM NO. 25B
Temple, New Hampshire

May 14, 1979
NH 00476

CHECK LISTS FOR VISUAL INSPECTION

AREA EVALUATED	BY	CONDITION & REMARKS
APPURTENANT STRUCTURES		
A. Drop Inlet Service Spillway Structure		
Condition of concrete	PR	Good
Spalling		None noted
Erosion		Mortar rubbed surface eroded
Cracking		None noted
Rusting or staining of concrete		None noted
Visible reinforcing		None noted
Efflorescence		None noted
Honeycombs		Minor at isolated locations
Trash racks		
Upper stage trash racks		No deficiencies noted
Lower stage trash rack		No deficiencies noted
Gate bench stand		No deficiencies noted
Exterior aluminum ladder		Existing ladder not accessible during normal or low flows. Ladder in good condition
B. Reservoir Discharge Conduit		Submerged, could not be observed
C. Outlet conduit (primary spillway)		
Condition of pipe	PR	No deficiencies noted. Right side of concrete cradle effloresced over 5% of surface. Minor exudation

APPENDIX B



GOLDBERG, ZOINO, DUNNCLIFF & ASSOC., INC.
GEOTECHNICAL CONSULTANTS
NEWTON UPPER FALLS, MASS.

U.S. ARMY ENGINEER DIV NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

SITE PLAN

SOUHEGAN RIVER WATERSHED

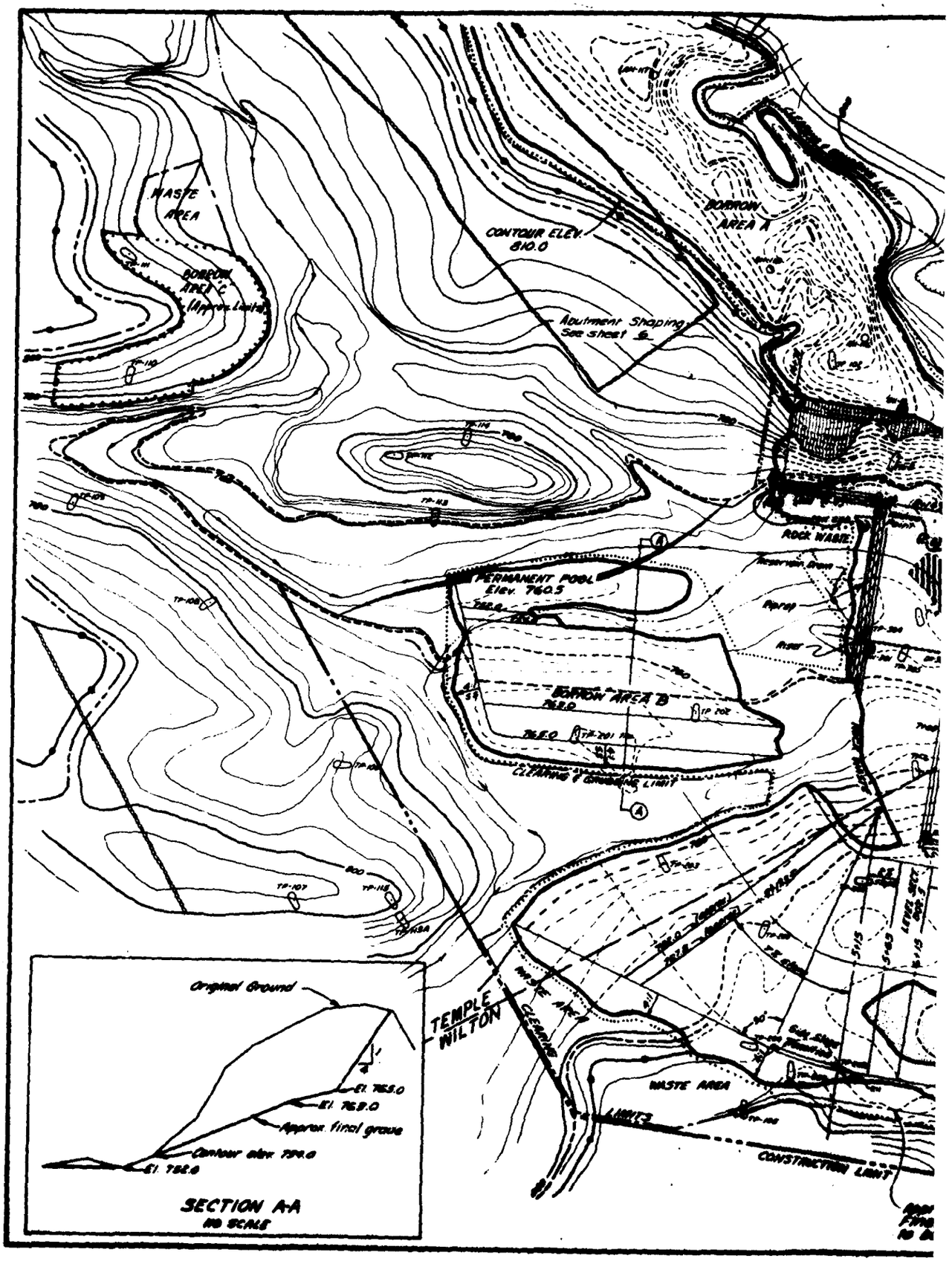
DAM No. 25b

NEW HAMPSHIRE

FILE No. 2327

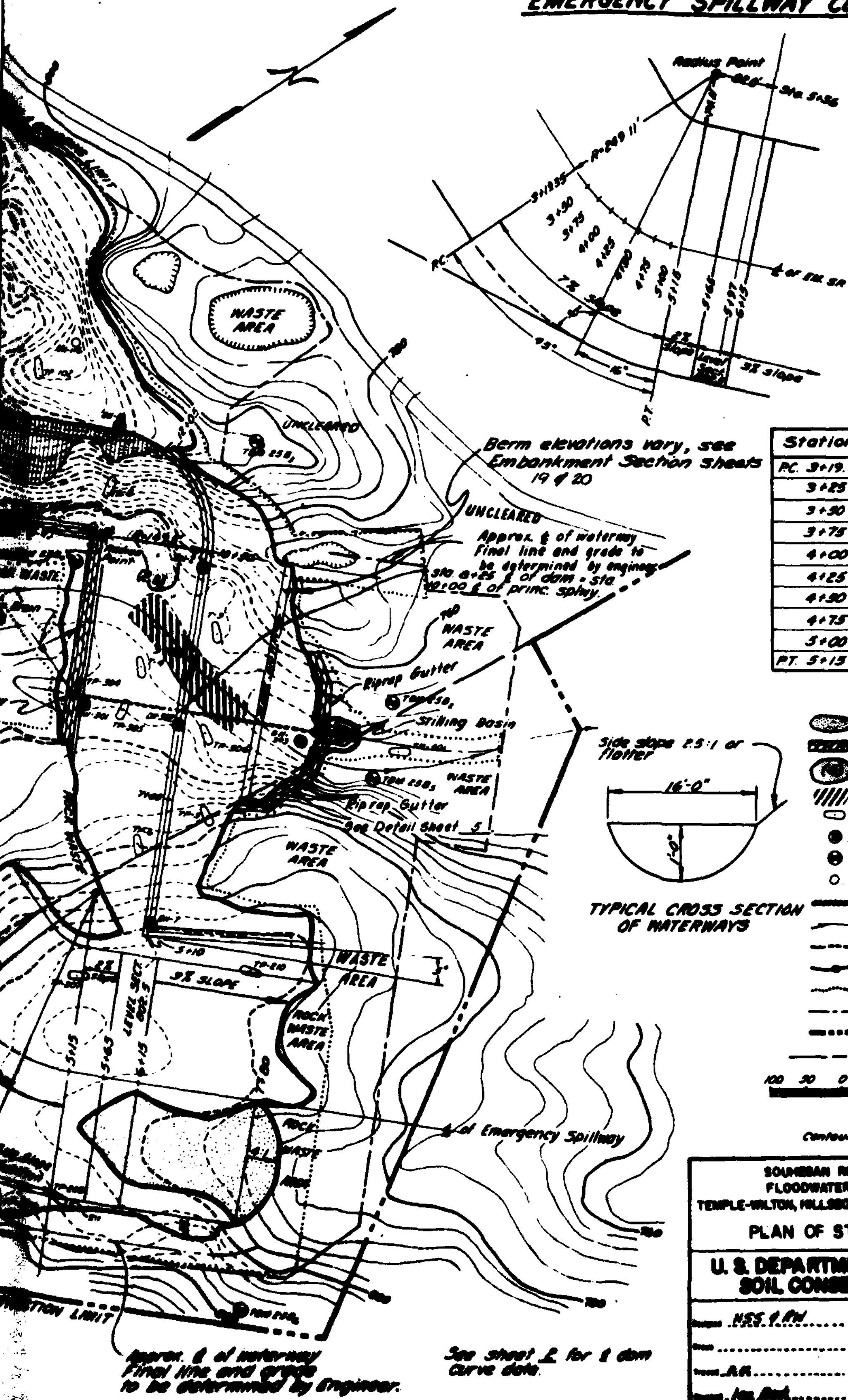
SCALE 1" = 400'

DATE JULY 1978


WASTE AREA
BORROW AREA C
(Approx. Limits)
CONTOUR ELEV. 810.0
Abutment Shaping See sheet 6
BORROW AREA A
ROCK WASTE
PERMANENT POOL Elev. 760.5
BORROW AREA B
760.0
CLEARING & GRUBBING LIMIT
TEMPLE WILTON
WASTE AREA
CONSTRUCTION LIMIT
Original Ground
El. 765.0
El. 768.0
Approx. final grade
Contour elev. 794.0
El. 788.0
SECTION A-A
NO SCALE

(1)

EMERGENCY SPILLWAY CURVE DATA



Δ = 45°
D = 23°-00'
R = 249.11 ft.
L = 195.65 ft.

Station	Chord	Def ∠
P.C. 3+19.35		0°-00'
3+25	5.65	0°-39'
3+50	24.99	3°-31'
3+75	24.99	6°-24'
4+00	24.99	9°-17'
4+25	24.99	12°-09'
4+50	24.99	15°-01'
4+75	24.99	17°-54'
5+00	24.99	20°-47'
P.T. 5+15	15.00	22°-30'

LEGEND

- Fill, Emer. Spwy.
- Riprap
- Depth of Muck
- Rock Outcrop
- Test Pit
- Drill Hole
- Temporary Bench Mark
- Auger Hole
- Stone Wall
- Stream
- Floodwater
- Design Highwater
- Grubbing Limits
- Clearing Limits
- Construction Limit
- Apparent Property Line

100 50 0 100 200
SCALE

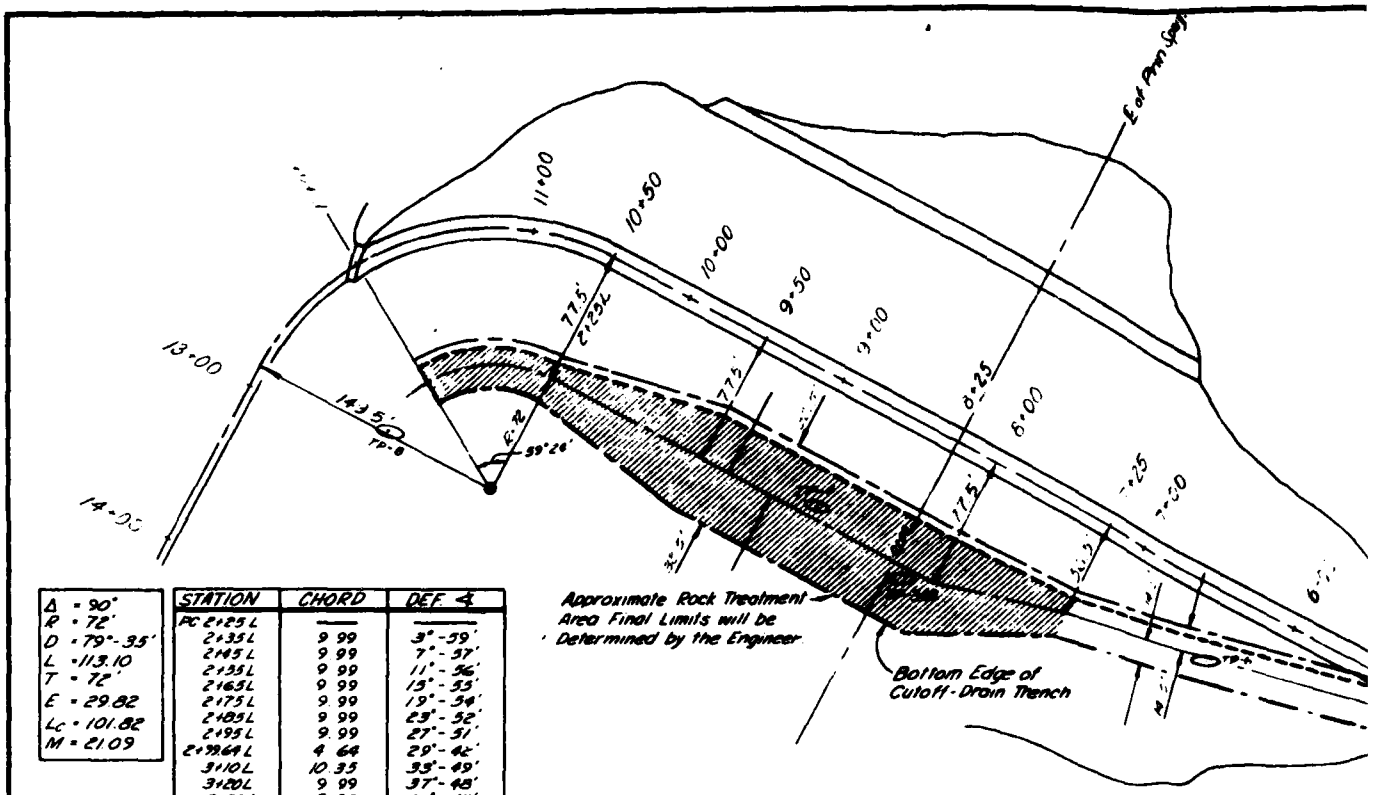
Contour Interval - 4 ft.

SOUHEGAN RIVER WATERSHED PROJECT
FLOODWATER RETARDING DAM NO. 28
TEMPLE-WILTON, HILLSBOROUGH, COUNTY, NEW HAMPSHIRE

PLAN OF STRUCTURAL WORKS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

NH-618-P

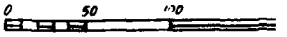


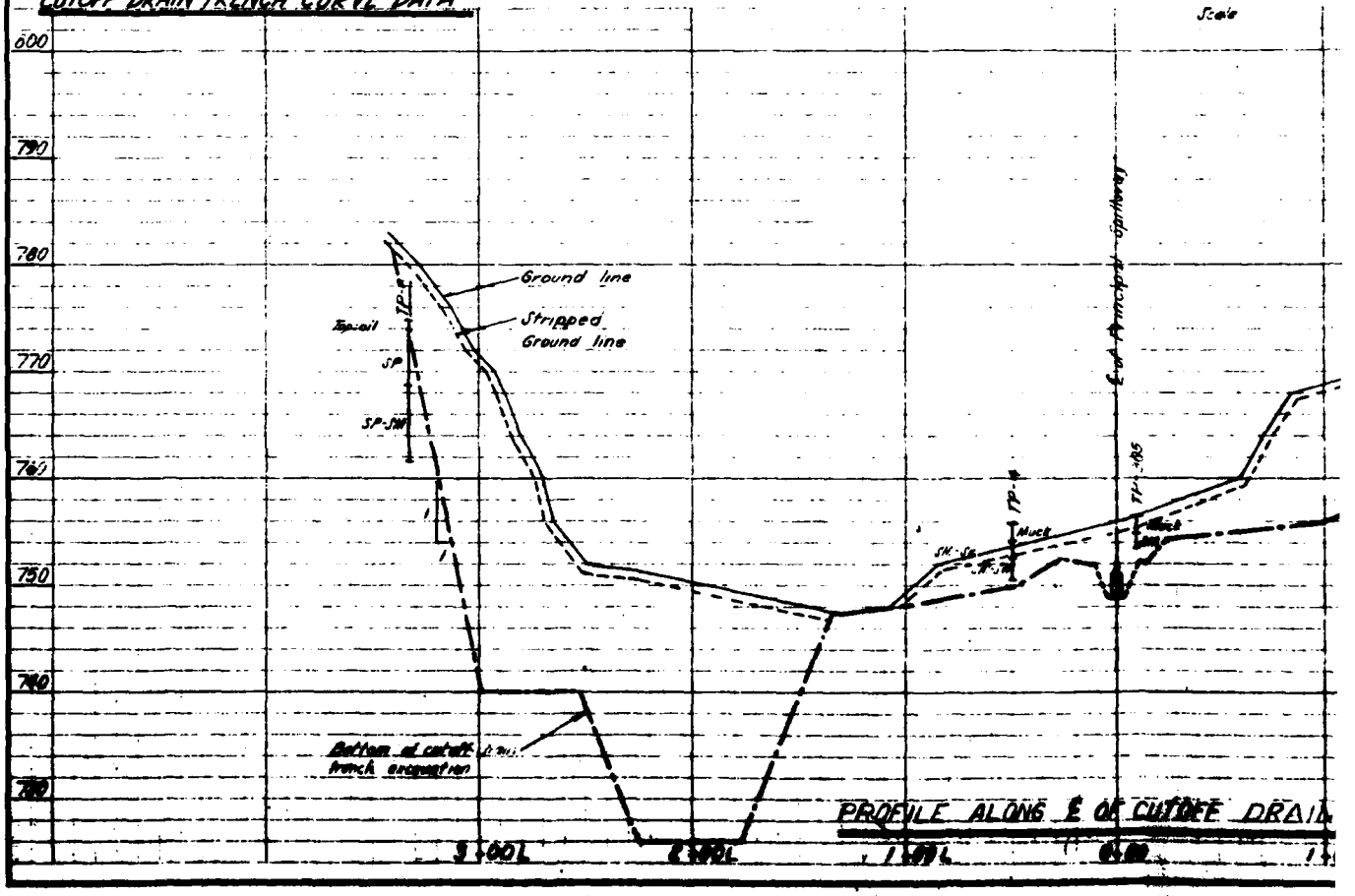
Δ = 90°
R = 72'
D = 79°-35'
L = 113.10
T = 72'
E = 29.82
Lc = 101.82
M = 21.09

STATION	CHORD	DEF. ∠
PC 2+25 L	—	—
2+35 L	9.99	3°-59'
2+45 L	9.99	7°-57'
2+55 L	9.99	11°-56'
2+65 L	9.99	15°-53'
2+75 L	9.99	19°-54'
2+85 L	9.99	23°-52'
2+95 L	9.99	27°-51'
2+99.64 L	4.64	29°-42'
3+10 L	10.35	33°-49'
3+20 L	9.99	37°-48'
3+30 L	9.99	41°-47'
PT 3+38.10 L	8.10	45°-00'

CUTOFF-DRAIN TRENCH CURVE DATA

PLAN VIEW OF CUTOFF-DRAIN TRENCH





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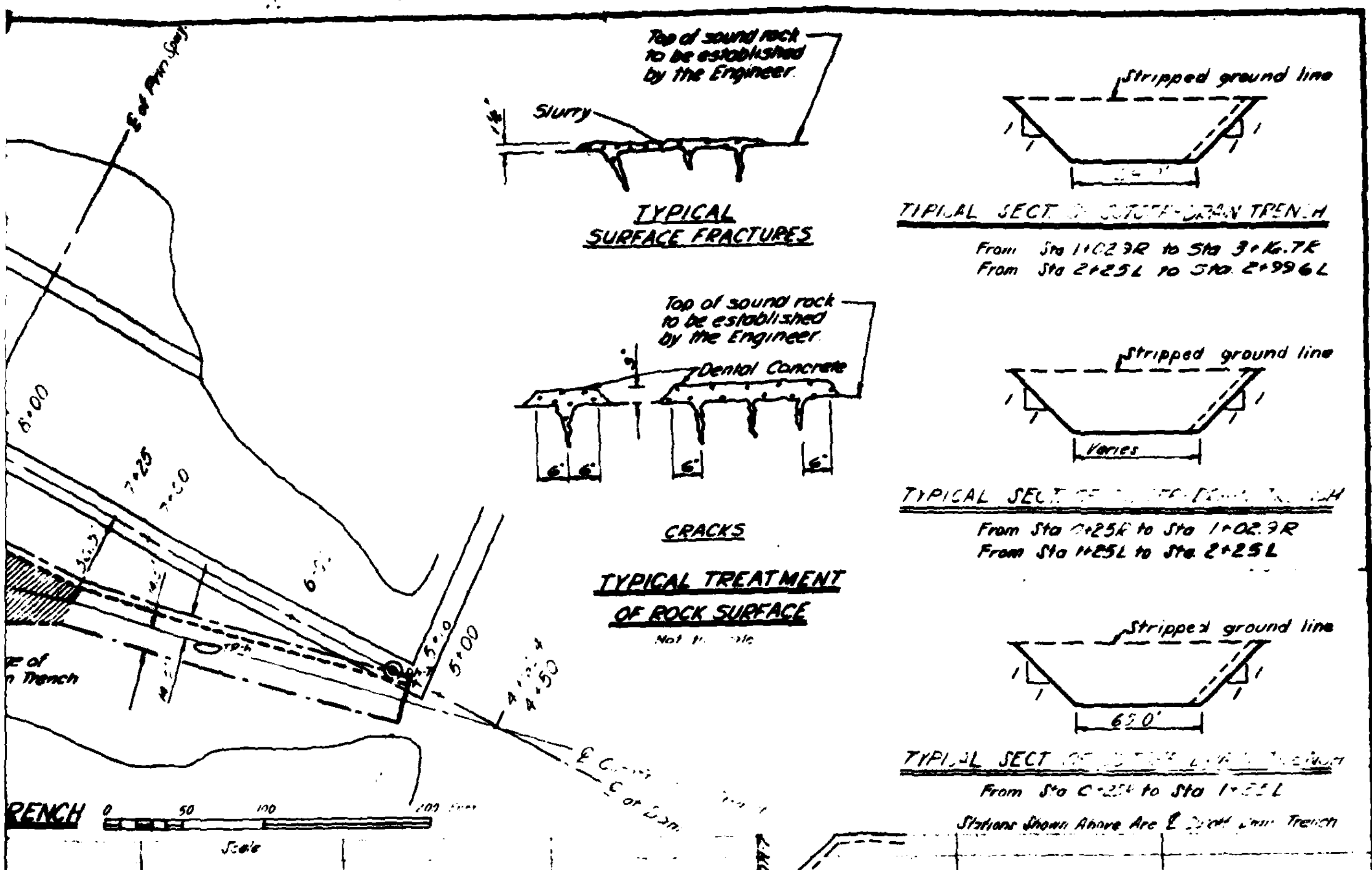
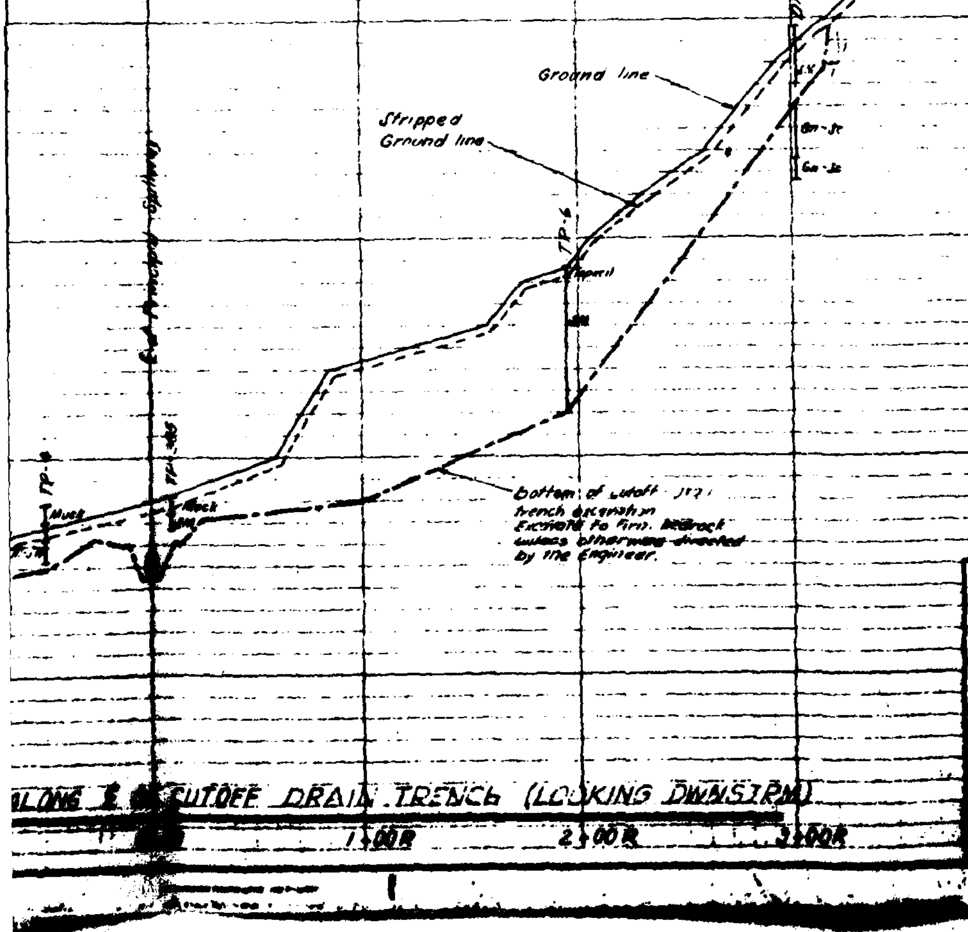




CONSTRUCTION DETAILS

1. The excavation limits are approximate and will be adjusted in accordance with conditions encountered.

2. Rock exposed in the bottom of the cutoff trench shall be thoroughly cleaned and shall be inspected by the engineer prior to placement of compacted till material.

3. The slopes of the finished Rock or Concrete surfaces in the cutoff drain trench shall not be steeper than 2 ft horizontal to 1 ft vertical except,

   a) If specifically shown otherwise on the drawing.

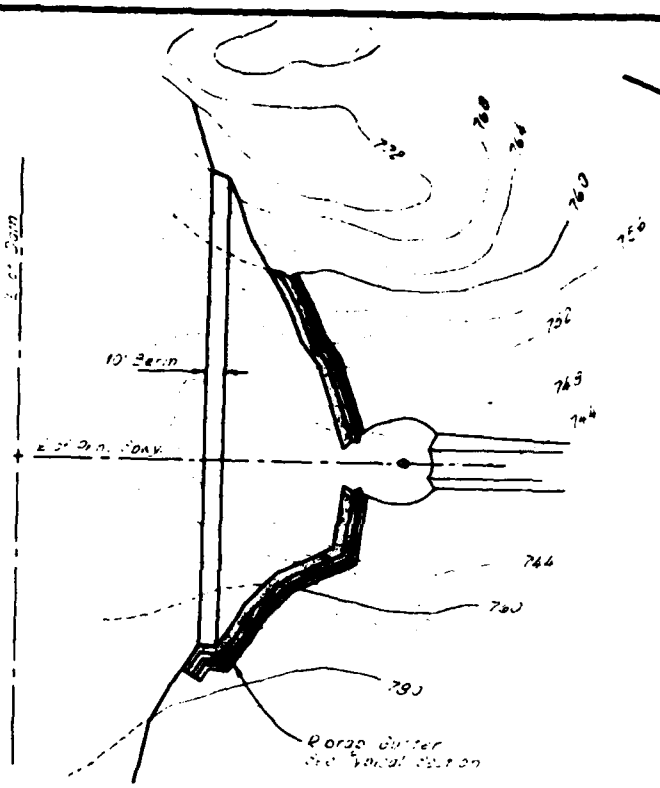
   b) For steeper positive sloped surfaces extending not more than 0.5 feet measured vertically in small local areas.

   c) As otherwise directed by the Engineer.

SOUHEGAN RIVER WATERSHED PROJECT
FLOODWATER RETARDING DAM NO 29B
TEMPLE - WILTON, HILLSBOROUGH COUNTY, NEW HAMPSHIRE

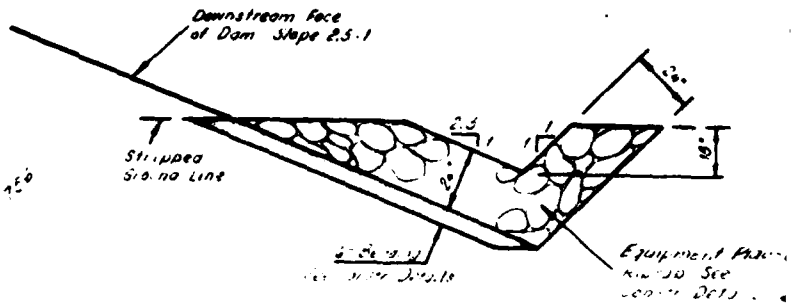
CUTOFF TRENCH DETAILS

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE



PLAN VIEW RIPRAP GUTTER

Not to scale

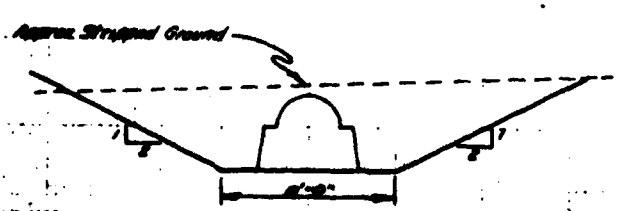


TYPICAL SECTION RIPRAP GUTTER

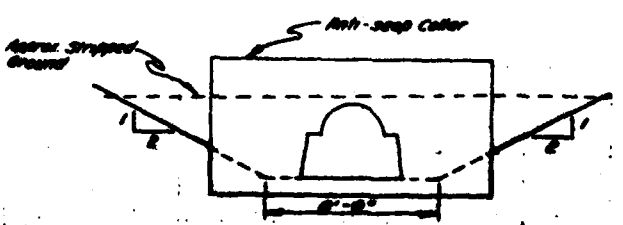
Not to scale

CONSTRUCTION DETAILS

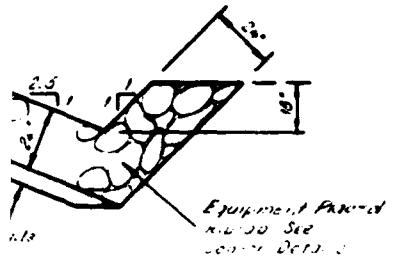
PROFILE ALONG ℄ OF PRINCIPAL SPILLWAY



PRINCIPAL SPILLWAY EXCAVATION



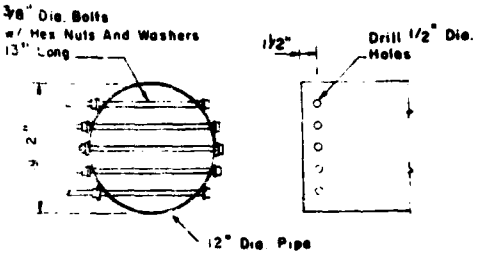
PRINCIPAL SPILLWAY EXCAVATION @ ANTI-SEEP COLLAR



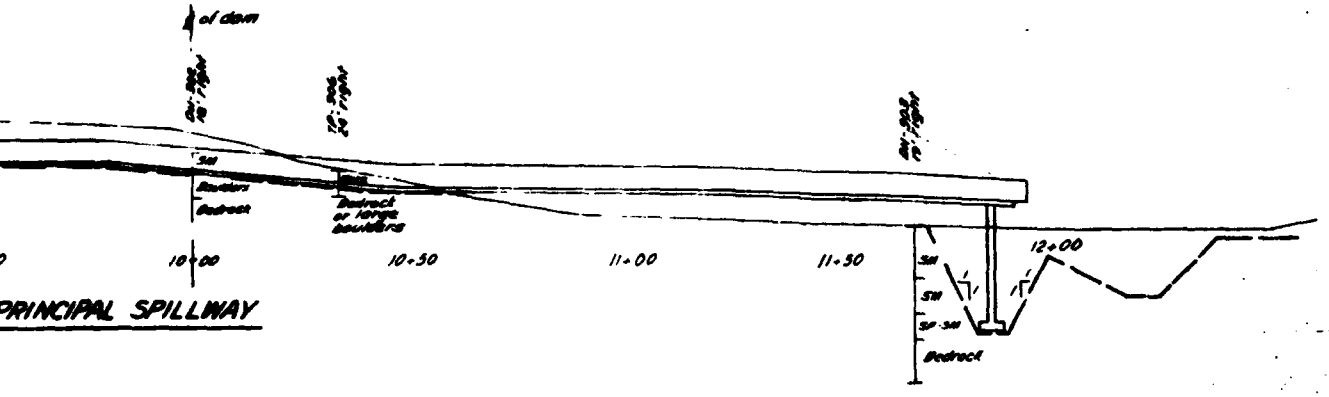
RIP

to scale

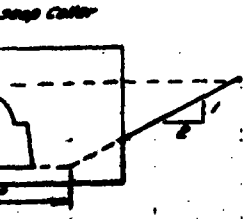
DETAILS



SMALL ANIMAL GUARD DETAILS



PRINCIPAL SPILLWAY



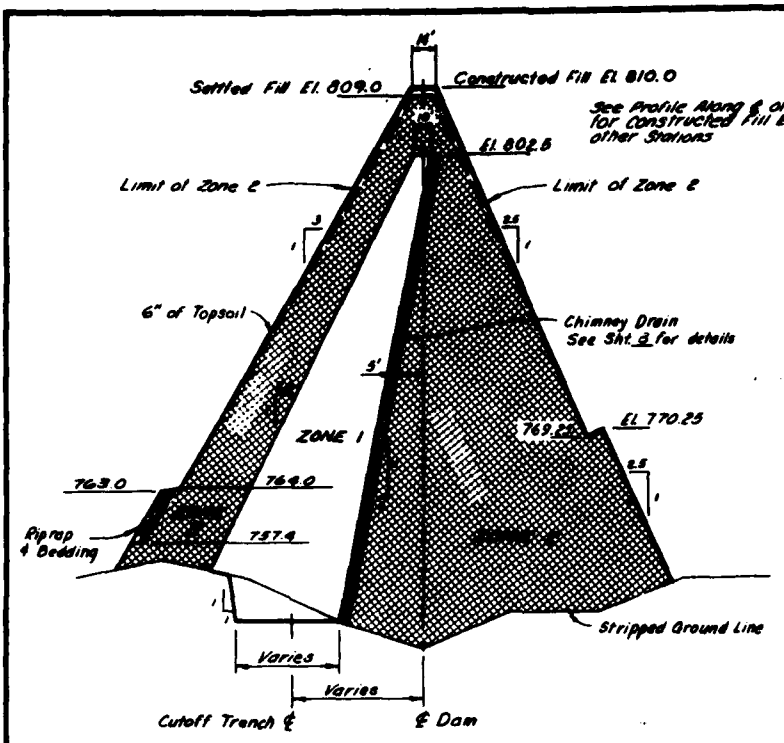
ANTI-SEEP COLLARS

SOUHEGAN RIVER WATERSHED PROJECT
FLOODWATER RETARDING DAM NO. 2SB
TEMPLE-WILTON, HILLSBOROUGH COUNTY, NEW HAMPSHIRE

PRINC. SPLWAY. EXCAV. & GUTTER DETAILS

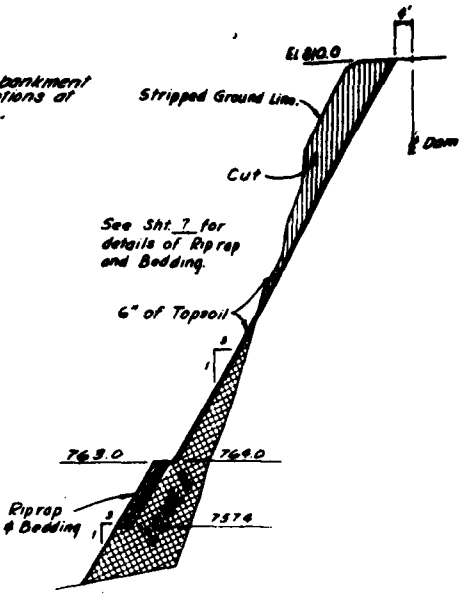
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

B-5



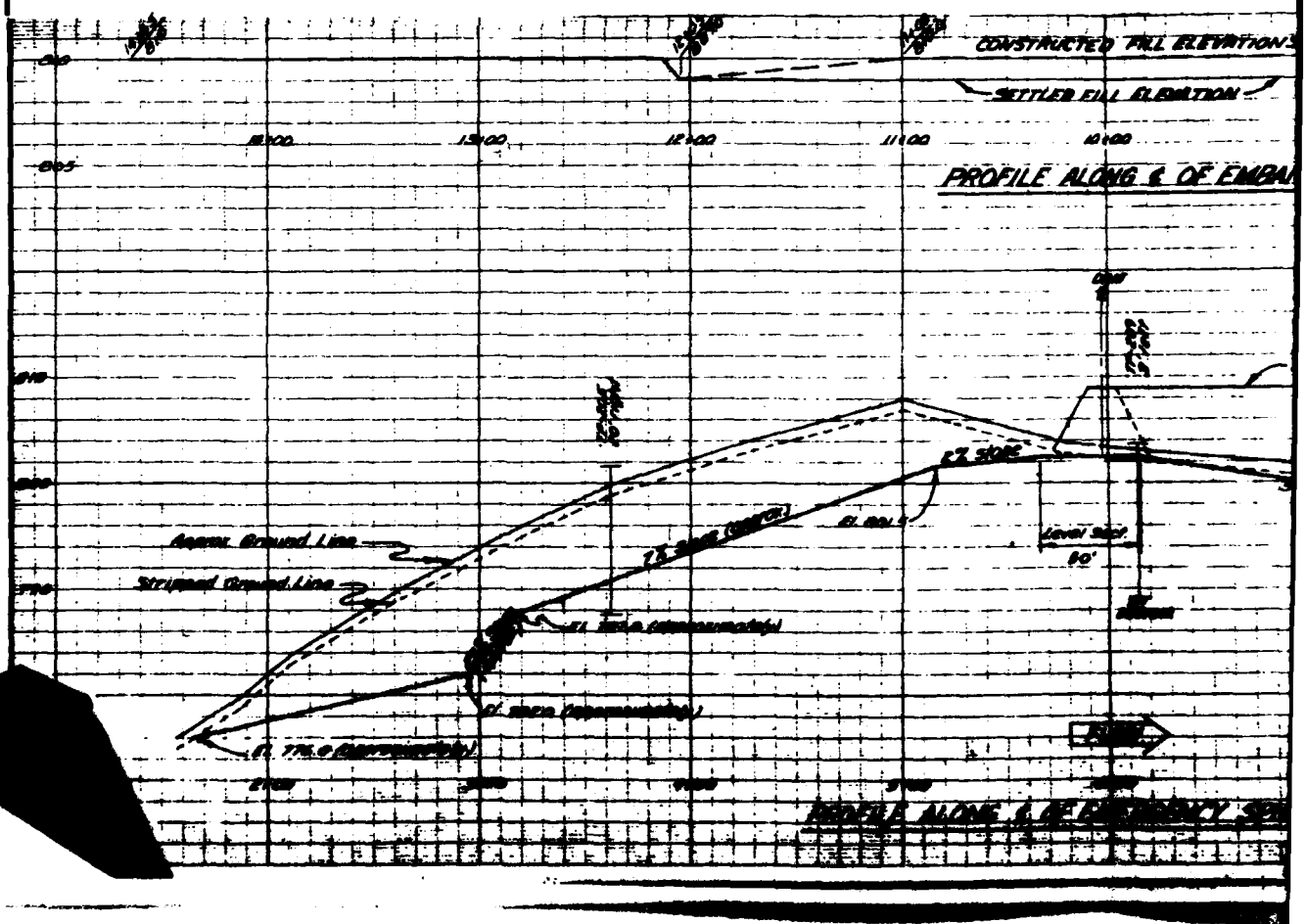
TYPICAL FILL PLACEMENT

STA. 5+10 TO STA. 12+05
SECTION OF EMBANKMENT @ STA. 9+00
Not to Scale

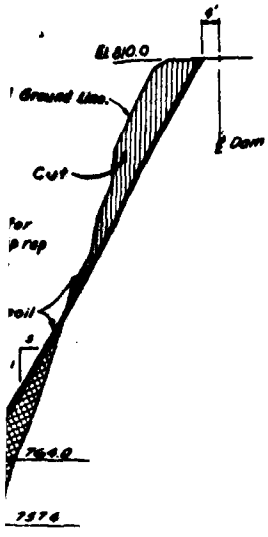


TYPICAL FILL PLACEMENT

STA. 12+05 TO STA. 14+70
SECTION OF EMBANKMENT @ STA. 13+60
Not to Scale

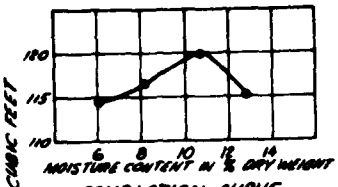


(1)

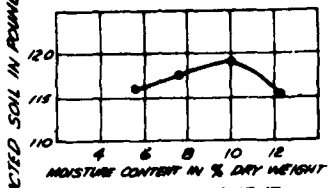


FILL PLACEMENT

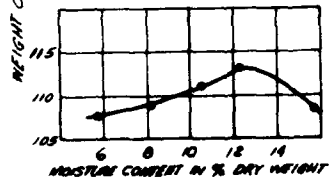
STA TO STA. 14+70
EMBANKMENT @ STA. 13+60
Wet to Scale



COMPACTION CURVE
FIELD SAMPLE NO. 205.1
LABORATORY CLASSIFICATION - SM



COMPACTION CURVE
FIELD SAMPLE NO. 207.1
LABORATORY CLASSIFICATION - SM



COMPACTION CURVE
FIELD SAMPLE NO. 111.2
LABORATORY CLASSIFICATION - SM

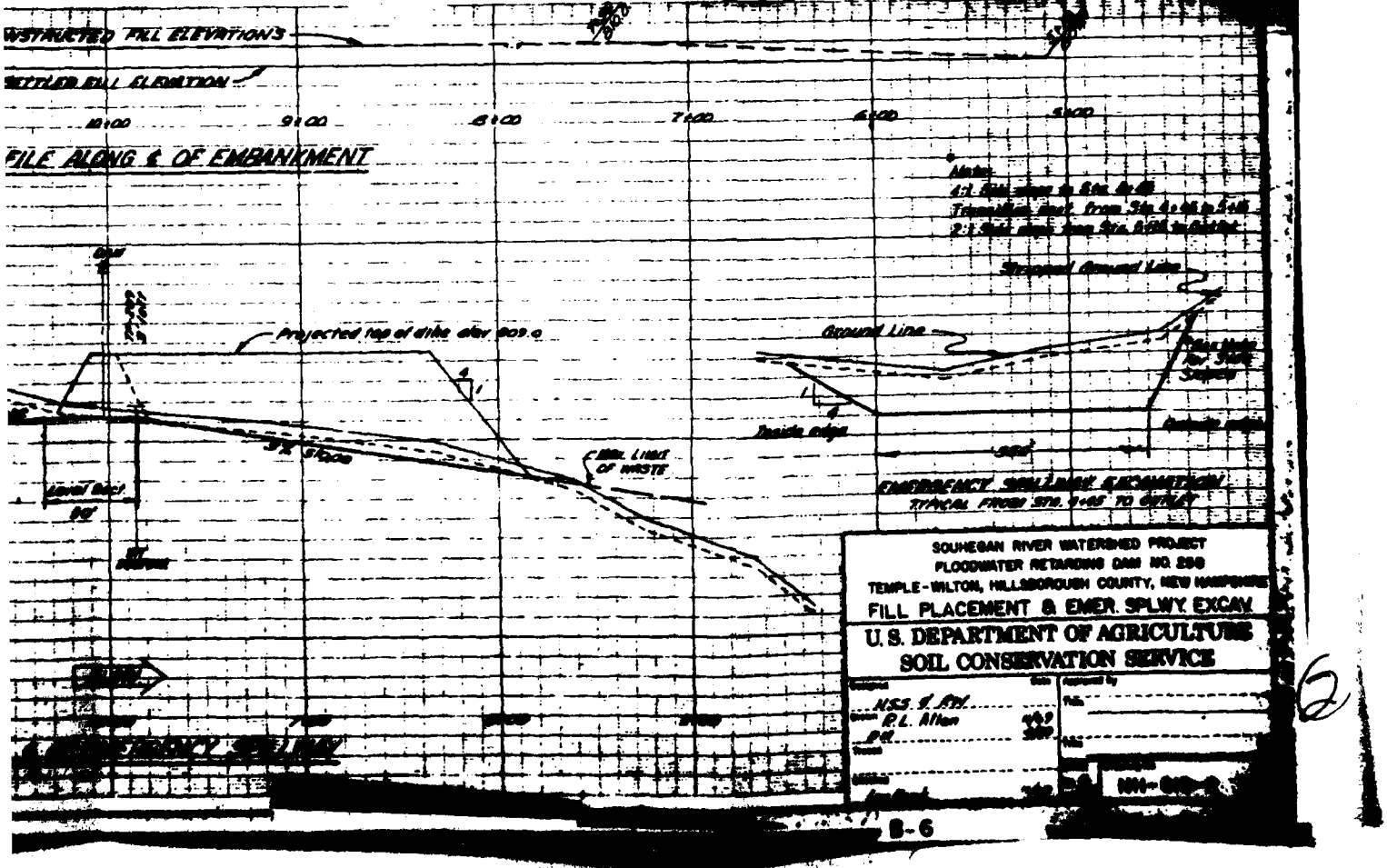
WT. OF COMP. SOIL IN LBS PER CUBIC FEET

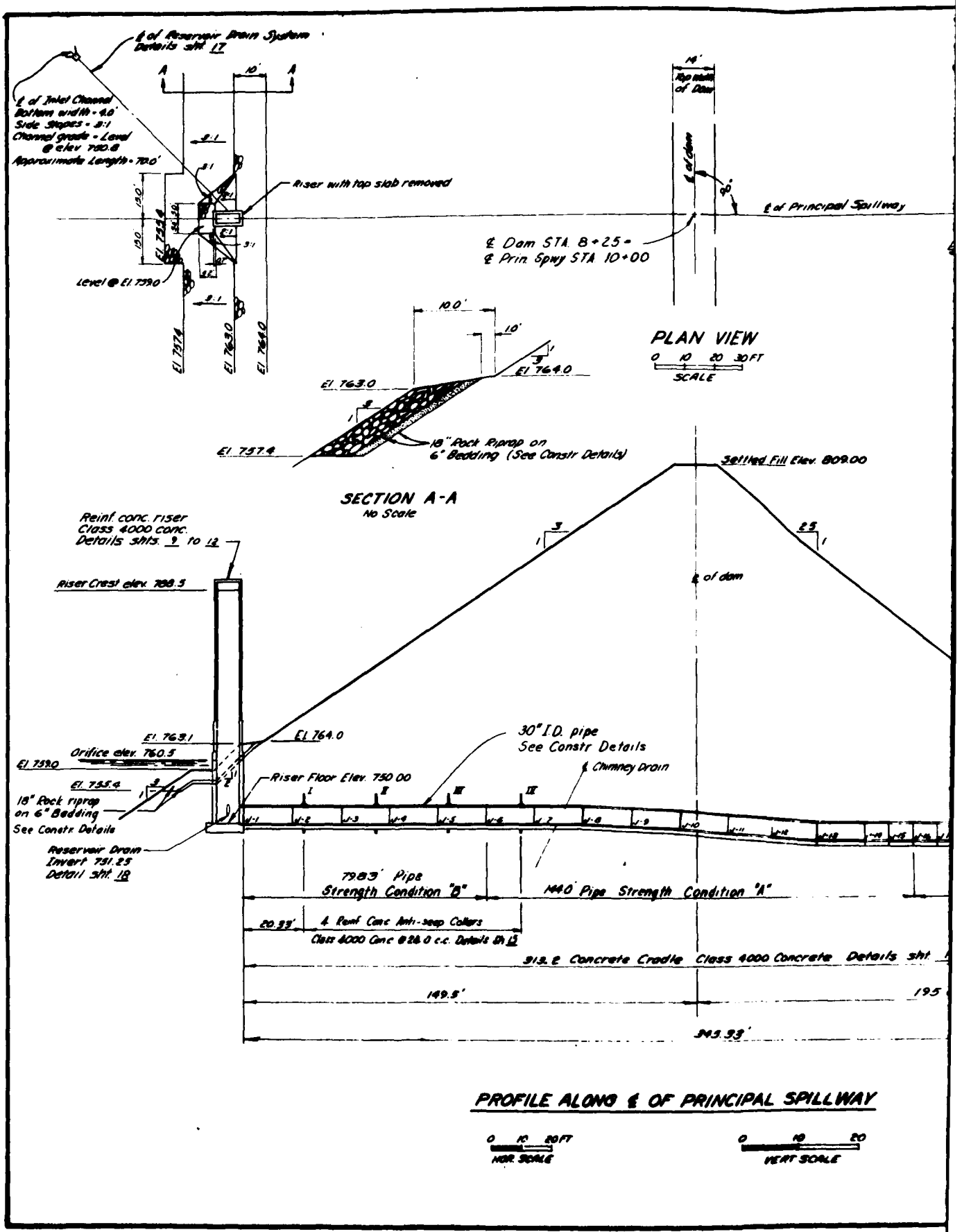
EARTH FILL REQUIREMENTS

ZONE	MATERIAL	MAX. ROCK SIZE	MAX. LIFT	REQ'D WATER CONTENT	COMPACTION CLASS	COMPACTION DESCRIPTION
1	SALTY SAND (SM) AS REPRESENTED BY THE LOGS OF TP 205 FROM 4.0' TO 14.0' & TP 207 FROM 4.0' TO 12.0' (BORROW AREA "B" & OTHER AREAS)	6"	9" [1]	OPTIMUM TO OPTIMUM +4%	A	100% OF MAX. DENSITY BY ASTM D698 METHOD A
2	SILTY SAND (SM) AS REPRESENTED BY THE LOG OF T-6 FROM 1.5' TO 5.0' & CLEAN SAND (SW) AS REPRESENTED BY THE LOG OF AH-116 FROM 1.0' TO 10.0', ALSO CLEAN FINE PERK SAND (SP) AS REPRESENTED BY THE LOG OF TP-102 FROM 12.0' TO 13.5' & 15.5' TO 32.5' (BORROW AREA "A" & OTHER AREAS)	16"	24" [3]	Wet [1]	C	See SPEC. #3 paragraph 6 & 13

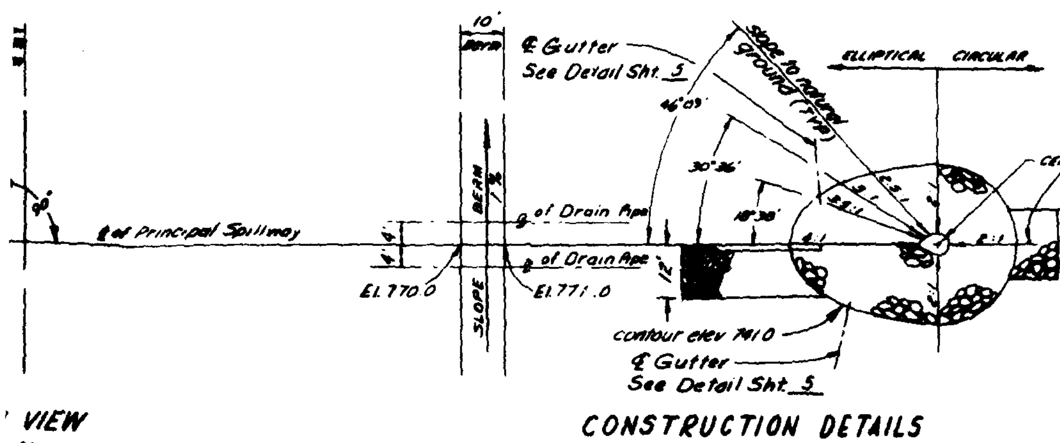
1. Thoroughly wet but not so wet as to cause adherence of the soil to wheels or tracks of equipment, nor to cause bogging down of equipment.
2. Maximum lift thickness is before compaction.
3. For fill adjacent to structures maximum rock size is 3".
4. Zone 1 shall include emergency spillway fill.
5. All Fill shall be selectively placed.

COMPACTION CURVE
FIELD SAMPLE NO. 204.1
LABORATORY CLASSIFICATION - ML




℄ of Reservoir Drain System Details sht 17
℄ of Inlet Channel Bottom width - 4.0' Side Slopes - 3:1 Channel grade - Level @ elev 750.0 Approximate Length - 70.0'
Riser with top slab removed
Level @ El 739.0
El 737.4
El 763.0
El 764.0
10.0'
℄ Dam STA. 8+25 = ℄ Prin. Spwy STA 10+00
℄ of Principal Spillway
14' Top width of Dam
℄ of dam
90°
PLAN VIEW
0 10 20 30 FT
SCALE
El 757.4
18" Rock Riprap on 6" Bedding (See Constr Details)
SECTION A-A
No Scale
Reinf. conc. riser Class 4000 conc. Details shts. 9 to 12
Riser Crest elev. 758.5
Settled Fill Elev. 809.00
℄ of dam
El 763.1
Orifice elev. 760.5
El 759.0
El 755.4
18" Rock riprap on 6" Bedding See Constr Details
Reservoir Drain Invert 751.25 Detail sht 18
El 764.0
30" I.D. pipe See Constr Details
℄ Chimney Drain
Riser Floor Elev. 750.00
I
II
III
IV
V-1
V-2
V-3
V-4
V-5
V-6
V-7
V-8
V-9
V-10
V-11
V-12
V-13
V-14
V-15
V-16
79.83' Pipe Strength Condition "B"
144.0' Pipe Strength Condition "A"
20.33'
℄ Reinf Conc Anti-seep Collars Class 4000 Conc @ 28.0 c.c. Details Sh 13
313.2 Concrete Cradle Class 4000 Concrete Details sht
149.5'
195
343.33'
PROFILE ALONG ℄ OF PRINCIPAL SPILLWAY
0 10 20 FT
HOR. SCALE
0 10 20
VERT SCALE

(1)



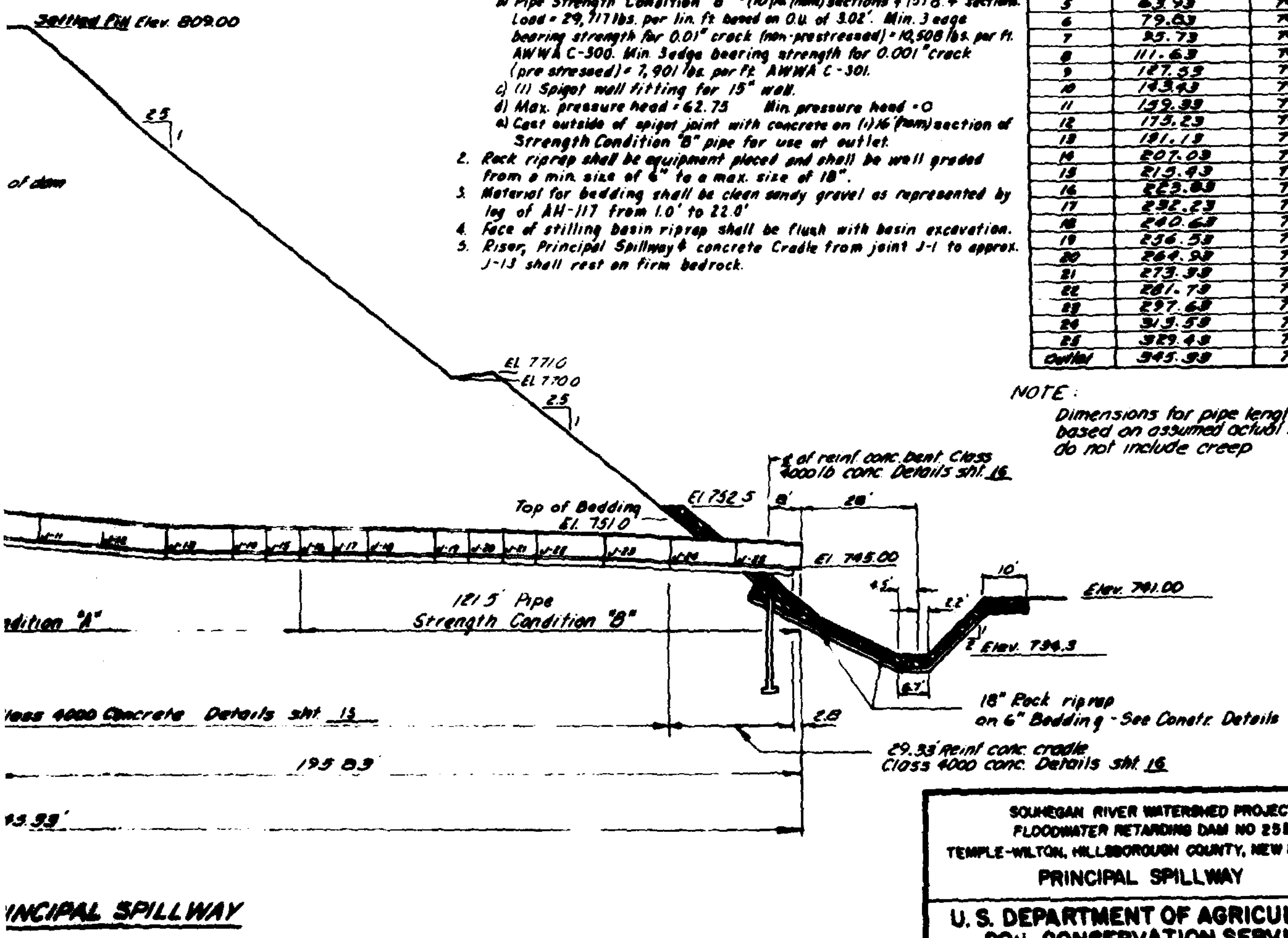
COLLAR	DISTANCE FROM RISER WALL	INVERT OF 30" ∅ PIPE
I	20.33	749.99
II	44.33	749.96
III	68.33	749.89
IV	92.33	749.86

CONSTRUCTION DETAILS

1. 30" inside dia. reinf conc. water pipe. Total length = 345.33'.
   a) Pipe Strength Condition "A" - (8) 16' (nom) sections & (2) 8.4' sections. Load = 54,116 lbs. per lin. ft. based on O.D. of 3.23'. Min. 3 edge bearing strength for 0.01" crack (non-prestressed) = 19,265 lbs. per ft. AWWA C-300. Min. 3 edge bearing strength for 0.001" crack (prestressed) = 14,485 lbs. per ft. AWWA C-301.
   b) Pipe Strength Condition "B" - (10) 16' (nom) sections & (5) 8.4' sections. Load = 29,717 lbs. per lin. ft. based on O.D. of 3.02'. Min. 3 edge bearing strength for 0.01" crack (non-prestressed) = 10,508 lbs. per ft. AWWA C-300. Min. 3 edge bearing strength for 0.001" crack (prestressed) = 7,901 lbs. per ft. AWWA C-301.
   c) (1) Spigot wall fitting for 15" wall.
   d) Max. pressure head = 62.75   Min. pressure head = 0
   e) Cast outside of spigot joint with concrete on (1) 16' (nom) section of Strength Condition "B" pipe for use at outlet.
2. Rock riprap shall be equipment placed and shall be well graded from a min. size of 6" to a max. size of 18".
3. Material for bedding shall be clean sandy gravel as represented by log of AH-117 from 1.0' to 22.0'
4. Face of stilling basin riprap shall be flush with basin excavation.
5. Riser, Principal Spillway & concrete Cradle from joint J-1 to approx. J-13 shall rest on firm bedrock.

JOINT	DISTANCE FROM RISER WALL	INVERT OF 30" ∅ PIPE
1	0.33	750.00
2	16.23	750.00
3	32.13	749.97
4	48.03	749.94
5	63.93	749.90
6	79.83	749.87
7	95.73	749.84
8	111.63	749.81
9	127.53	749.63
10	143.43	749.14
11	159.33	748.51
12	175.23	747.87
13	191.13	747.30
14	207.03	747.18
15	215.43	747.14
16	223.83	747.08
17	232.23	747.02
18	240.63	746.94
19	256.53	746.76
20	264.93	746.65
21	273.33	746.52
22	281.73	746.39
23	297.63	746.10
24	313.53	745.78
25	329.43	745.41
Outlet	345.33	745.00

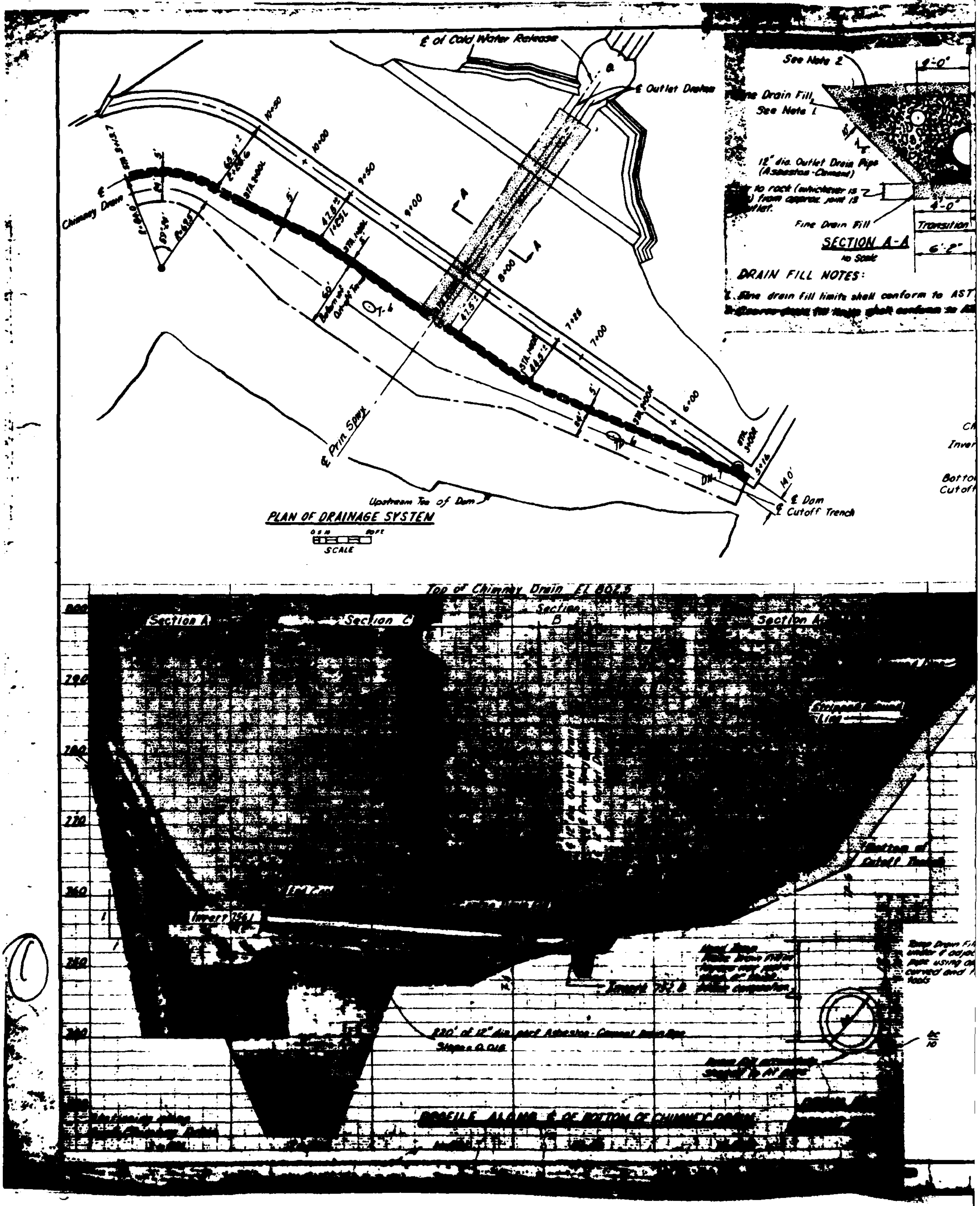
NOTE:
Dimensions for pipe lengths are based on assumed actual lengths & do not include creep



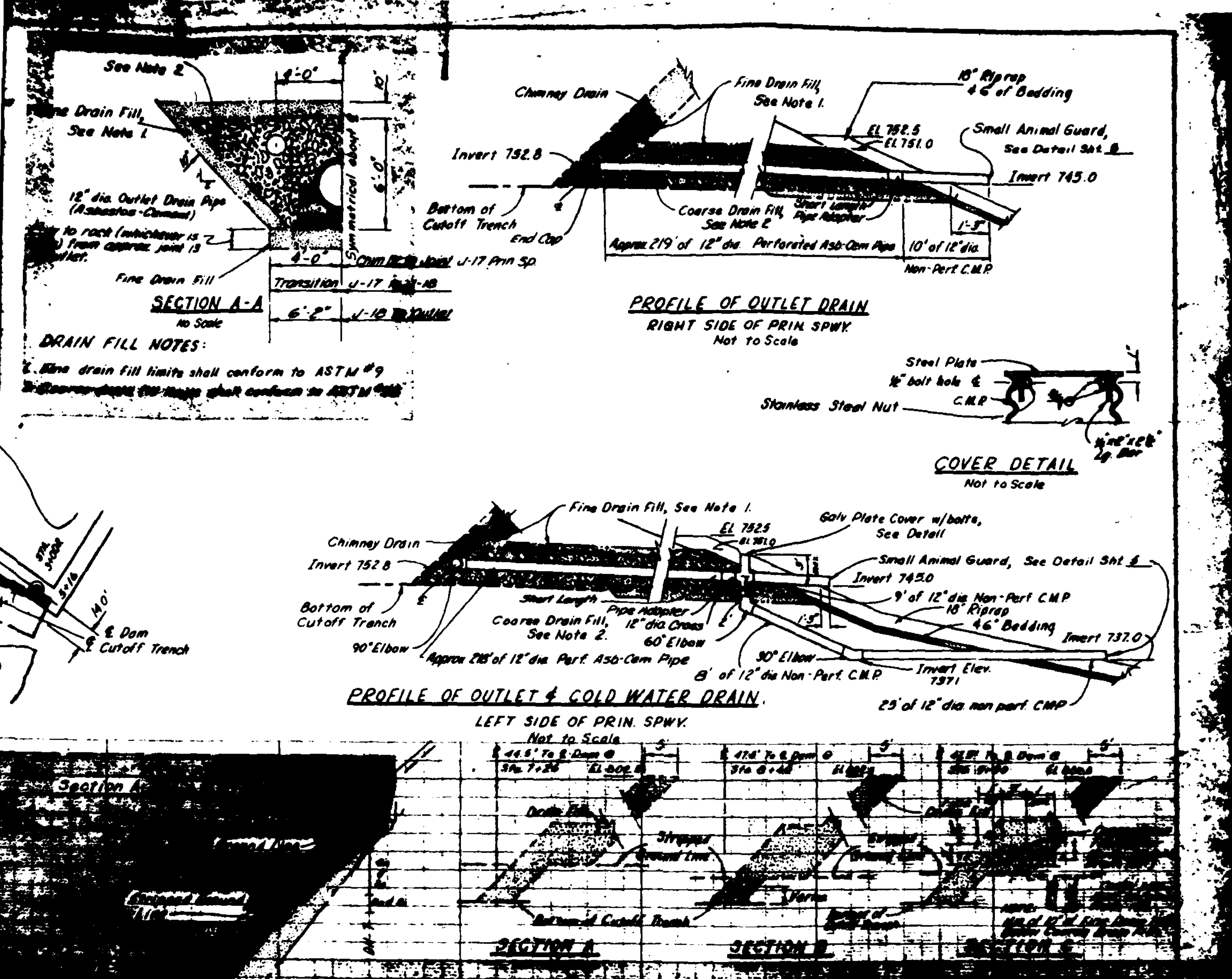
SOUHEGAN RIVER WATERSHED PROJECT
FLOODWATER RETARDING DAM NO 25B
TEMPLE-WILTON, HILLSBOROUGH COUNTY, NEW HAMPSHIRE
PRINCIPAL SPILLWAY

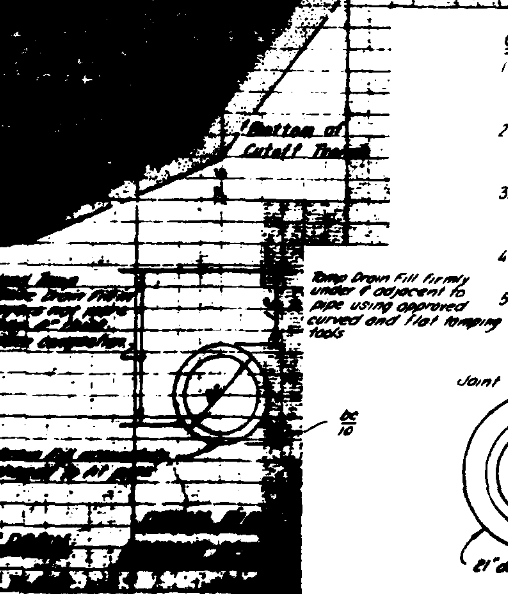
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed R. Goodnow	1-67	Approved by	
Drawn D.M.	4-68	Title	
Traced		Title	
Checked Leo Bach	11/68	Sheet 7	Drawing No. NH-619-P



℄ of Cold Water Release
℄ Outlet Drain
℄ Chimney Drain
℄ Prin Spwy
Upstream Toe of Dam
℄ Dam
℄ Cutoff Trench
PLAN OF DRAINAGE SYSTEM
SCALE
See Note 2
Fine Drain Fill
See Note 1
12" dia. Outlet Drain Pipe (Asbestos-Cement)
Fine Drain Fill
Transition
SECTION A-A
No Scale
DRAIN FILL NOTES:
Top of Chimney Drain El 802.5
Section A
Section C
Section B
Invert 756.1
Invert 752.8
Bottom of Cutoff Trench
230' of 12" dia. perf Asbestos-Cement Drain Pipe
Slope = 0.018



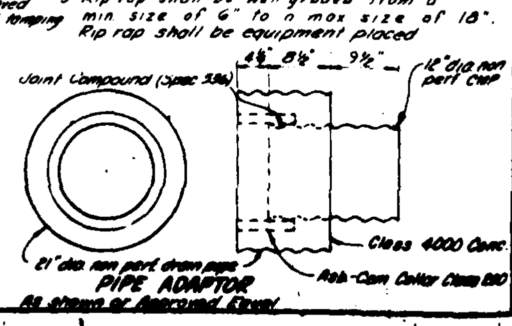


CONSTRUCTION DETAILS:

1. Perforated drain pipe shall conform to Spec 545 and shall be 12" Dia. Pressure Pipe, Class 200, Type II. (Asbestos Cement)
2. Non perforated drain pipe shall conform to Spec 551 and shall be 16 gauge, shape I, class I. type G (CMP)
3. The excavation limits are approximate and will be adjusted in accordance with conditions encountered.
4. See sheets 23 & 24 for logs of test holes.
5. Rip rap shall be well graded from a min. size of 6" to a max size of 18". Rip rap shall be equipment placed

QUANTITY SUMMARY:

8709	Cu Yds Drain Fill - Fine
817	Cu Yds Drain Fill - Coarse
657	12" Dia perforated pipe (Asb-Cem)
52	12" Dia non perforated pipe (CMP)
2	End Caps, For Asb-Cem Pipe
1	90° Elbow, For Asb-Cem Pipe
1	60° Elbow (CMP)
1	Cross (CMP)
3	Small Animal Guards
1	13½" Dia, ¼" Steel Plate
2	⅜" Dia Bolts with nut & washer 1½" Lg. Stainless Steel Hex Hd
1	90° Elbow (CMP)
2	Adaptors (Asb-Cem to CMP)



SOUHEGAN RIVER WATERSHED PROJECT
FLOODWATER RETARDING DAM NO 25B
TEMPLE-WILTON, HILLSBOROUGH COUNTY, NEW HAMPSHIRE

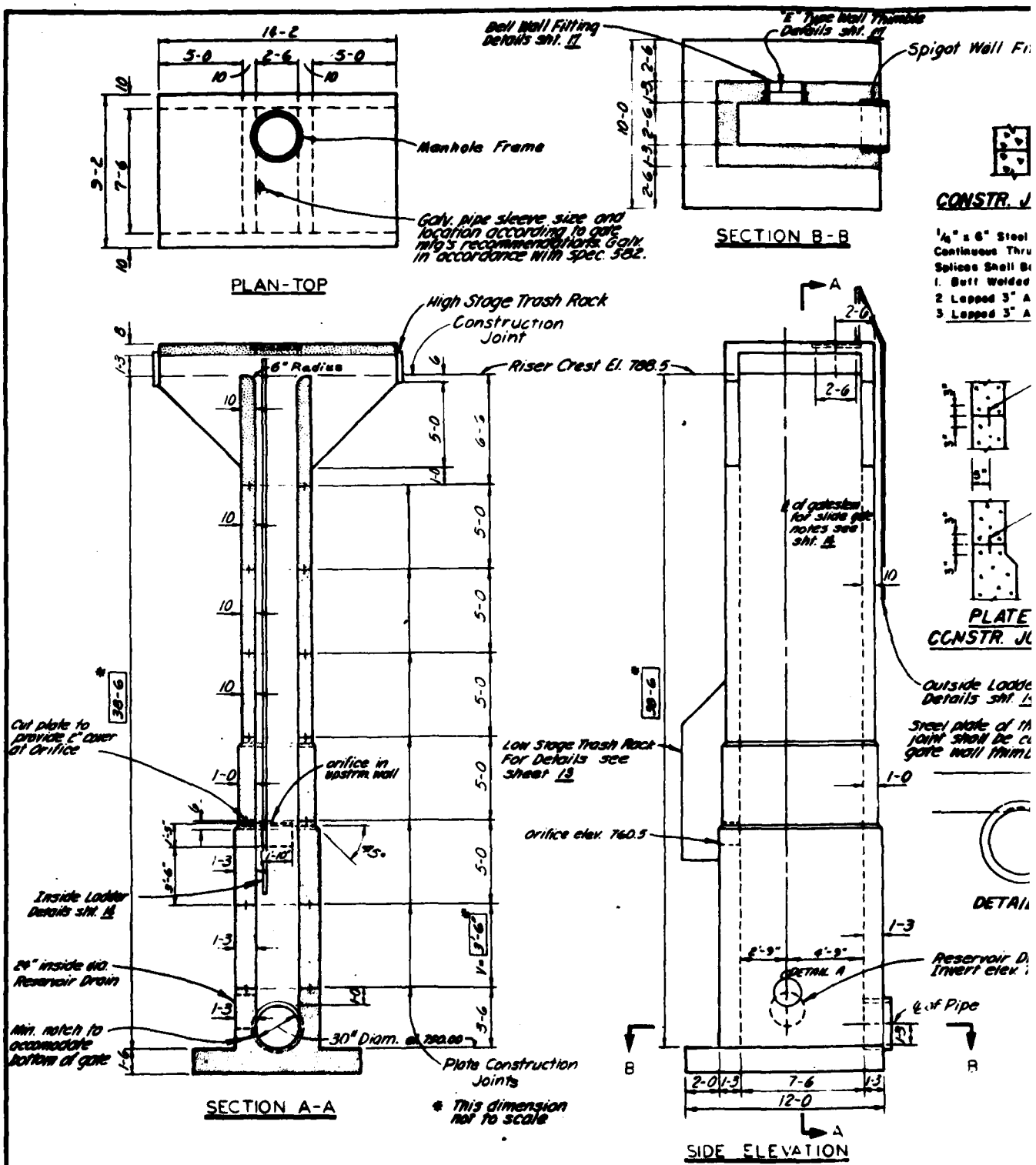
CHIMNEY DRAIN DETAILS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed	J.M. Zurlo	8/69
Drawn	R. Allen, C.M. Murdoch	11/69
Traced		
Checked	Lee Bush	11/69

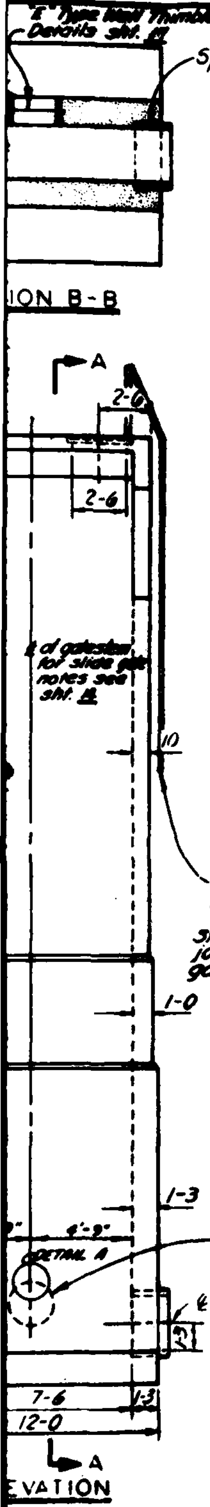
Approved by .... Title ....

Drawing No. NH-618-P



STANDARD COVERED RISER	
DESIGN CONSTANTS	f'_c = 4000 psi, f_c = 1800 psi, n = 8, f_s = 20,000 psi
STANDARD DRAWING NO.	ES-3030-4020E
DATE 8-61	SHEET 1 OF 4

(1)



EVATION

CONSTR. JOINT

¼" x 6" Steel Plate, Continuous Thru Constr Joint. Splices Shall Be Either:
1. Butt Welded
2. Lapped 3" And Bolted
3. Lapped 3" And Fillet Welded

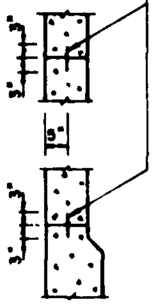
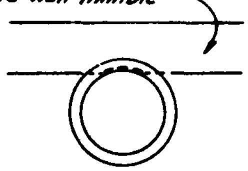


PLATE CONSTR. JOINT

Outside Ladder Details sht. 14

Steel plate of the plate construction joint shall be cut and welded to gate wall thimble

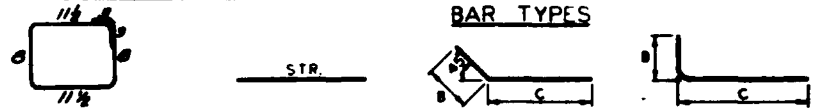


DETAIL A

STEEL SCHEDULE

Mark	Size	Quantity	Length	Type	B	C	Total Length	Mark	Size	Quantity	Length	Type	B	C	Total Length
B1	#6	12	9-6	1			114-0	R30	#5	20	8-0	21	2-9	5-3	160-0
B2	#6	10	11-6	1			115-0	R31	#6	6	5-0	1			30-0
B3	#7	38	10-0	21	3-5	6-7	380-0	R32	#6	2	8-0	1			16-0
B4	#6	10	11-6	1			115-0								
B5	#6	12	9-6	1			114-0								
B6	#6	2	4-0	1			8-0	R33	#3	4	3-9	T2			15-0
B7	#6	6	7-6	21	1-0	6-6	45-0								
B8	#6	19	7-6	21	1-0	6-6	142-6								
B9	#5	14	8-6	1			119-0								
B10	#6	5	3-6	1			17-6								
B11	#6	3	2-9	1			8-3	T1	#5	18	6-0	1			108-0
B12	#6	2	2-9	1			5-6	T2	#5	6	8-0	1			48-0
B13	#6	10	6-9	21	0-10	5-11	67-6	T3	#5	4	4-9	1			19-0
B14	#6	18	9-3	21	3-4	5-11	166-6	T4	#5	4	3-6	1			14-0
								T5	#5	4	2-3	1			9-0
								T6	#5	4	9-0	19	2-0	7-0	36-0
								T7	#5	12	8-3	1			99-0
								T8	#5	2	3-3	1			6-6
								T9	#5	2	5-9	1			11-6
								T10	#5	2	10-9	1			21-6
								T11	#5	2	13-3	1			26-6
								T12	#5	14	6-3	1			87-6
								T13	#5	6	8-0	1			48-0
R1	#6	22	10-3	1			225-6	T14	#5	4	6-0	1			24-0
R2	#5	14	8-6	1			119-0	T15	#5	4	4-9	1			19-0
R3	#6	8	3-6	1			28-0	T16	#5	4	3-6	1			14-0
R4	#6	28	8-0	1			224-0	T17	#5	4	2-3	1			9-0
R5	#6	28	9-3	21	3-4	5-11	259-0	T18	#5	4	9-0	19	2-0	7-0	36-0
R6	#6	14	8-6	1			119-0	T19	#5	24	8-0	21	2-9	5-3	192-0
R7	#6	10	3-6	1			35-0	T20	#5	2	3-3	1			6-6
R8	#6	20	3-6	1			70-0	T21	#5	2	5-9	1			11-6
R9	#5	38	8-9	21	3-1½	5-7½	332-6	T22	#5	2	8-3	1			16-6
R10	#5	4	8-3	21	2-10½	5-4½	33-0	T23	#5	2	10-9	1			21-6
R11	#5	22	6-9	1			148-6	T24	#5	2	13-3	1			26-6
R12	#6	14	8-3	1			115-6	T25	#5	4	13-9	1			55-0
R13	#5	11	3-6	1			38-6	T26	#5	4	13-9	1			55-0
R14	#5	26	4-6	1			117-0	T27	#4	10	8-3	1			82-6
R15	#5	20	3-3	1			65-0	T28	#6	7	4-9	1			33-3
R16	#5	38	8-3	21	2-10½	5-4½	313-6	T29	#4	7	13-9	1			96-3
R17	#5	4	8-0	21	2-9	5-3	32-0	T30	#4	4	5-3	1			21-0
R18	#5	20	11-9	1			235-0	T31	#5	24	6-9	21	1-6	5-3	162-0
R19	#5	14	8-3	1			115-6	T32	#5	2	6-6	21	1-6	5-0	13-0
R20	#5	8	3-3	1			26-0	T33	#5	2	2-6	21	1-6	1-0	5-0
R21	#5	20	11-9	1			235-0	T34	#4	7	13-9	1			96-3
R22	#5	40	8-0	21	2-9	5-3	320-0	T35	#4	4	5-3	1			21-0
R23	#5	10	8-3	1			82-6	T36	#6	4	8-3	1			33-0
R24	#5	8	3-3	1			26-0								
R25	#5	28	8-0	21	2-9	5-3	224-0								
R26	#5	20	6-9	1			135-0								
R27	#5	8	8-3	1			66-0								
R28	#5	8	3-3	1			26-0								
R29	#5	20	6-9	1			135-0								

BAR TYPES



Notes:
1. Bar dimensions are out to out of bar.
2. Radius of bends equals 3 bar diameters for sizes equal to or less than #7.
3. The 2" and 3" dimensions from face of concrete to steel are clear distances.

0 2 4 6
Scale in Feet

5.6 Lbs.
211.8 Lbs.
[illegible] Lbs.
[illegible] Lbs.
7767 Lbs.
[illegible] Lbs.

R2).
R1, R3, R4 and R6).

[illegible] Cu. Yds.

Notes:
1. For Manhole Cover and Frame, See Detail Sheet 16
2. For Spigot Wall Fitting, See Detail Sheet 17
3. For Trash Rack, Grating, Sleeves and Bolts, See Detail Sheet 18

SOUHEGAN RIVER WATERSHED PROJECT
FLOODWATER RETARDING DAM NO. [illegible]
TEMPLE-WILTON, HILLSBOROUGH COUNTY, NEW HAMPSHIRE
RISER DETAILS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

T-3; STAT. 0+89, 9+X; Elev. [illegible]

Depth	Description	Class
0.0 - 1.0	Topsoil; colluvial or alluvial in origin	
1.0 - 2.0	Sand, silty, iron stained, moist, semi-pervious, dense; cemented layer (Ortstein) just on top of ledge; 10% gravel; 5% stones over 3".	(SM)
2.0 -	Bedrock: resembles gneiss, crystalline; sound; somewhat weathered; iron-stained; occasional fractures; silicified in places (Littleton formation) Approximate strike N-S, dip 10° West.	

Trench 25' long, bearing N 70° W
Profile of alluvial or colluvial origin

T-4; STAT. B+81, 8+98; ELEV. 755.8

Depth	Description	Class
0.0 - 1.5	Muck, black	
1.5 - 3.0	Sand, silty, reddish-brown; moist; semi-pervious, dense.	(SM)
3.0 - 5.0	Sand, silty, same as above except olive gray and wet.	(SM)
5.0 -	Gneiss, sound, unweathered	

Water table at 3.0. April 23, 1963
Soil material derived from glacial till; depth to bedrock varies from 4.4 to 7.0.

TP 5; STAT. 0+75, 6+[illegible]; ELEV. 776.8

Depth	Description	Class
0.0 - 1.0	Topsoil: black, 5-10 stones over 1 cubic yard per surface acre	
1.0 - 2.0	Sand, medium, silty, reddish, moist, semi-pervious, dense.	(SM)
2.0 -13.0	Sand, medium, silty, pale yellow-olive, moist, semi-pervious, dense; streaks of SP; 15% stones over 3".	(SM)
13.0 -	Bedrock or large boulder: smooth surface, no fractures, sound, non-weathered appearance with silica; possible igneous origin?	

Soil material derived from glacial till.

TP 6; STAT. B+75, 6+50; ELEV. 777.5

Depth	Description	Class
0.0 - 1.0	Topsoil; 5-10 stones over 1 cubic yard per surface acre	
1.0 -13.5	Sand, silty, reddish-yellow, moist, semi-pervious, dense; 20% stones over 3". Tends toward platiness.	(SM)
13.5 -	Bedrock: blackish, crystalline appearance (Littleton formation)	

½ gallon/min. seep on top of ledge.
Soil material derived from glacial till.

TP 8; STAT. B+39; 11+40; ELEV. 754.8

Depth	Description	Class
0.0 - 1.0	Topsoil, no surface stones apparent	
1.0 - 6.0	Sand, clean, uniform, fine to medium, bright yellow, moist, pervious, dense; 5% gravel, 1-2% stones over 3".	(SP)
6.0 -13.0	Sand, uniform, fine to medium with some silt, olive-gray, moist, semi-pervious, dense; some stratified ½" layers of ML.	(SP-SM)

Water table at 6' on top of silt layer.
April 23, 1963.
Profile glaciofluvial in origin.

TP 102; STAT. A+41, 13+03; ELEV. 841.6

Depth	Description	Class
0.0 - 1.0	Topsoil: 5 stones over 1 cubic yard per surface acre	
1.0 - 3.0	Sand, clean, variable, medium to coarse, yellow-brown, moist, pervious, dense.	(SP)
3.0 - 4.0	Sand, clean, well-graded, yellow-brown, dry, pervious, dense.	(SW)
4.0 - 6.0	Sand, clean, variable, medium to coarse, yellow-brown, moist, pervious, dense.	(SP)
6.0 - 7.0	Sand, clean, fine, uniform, yellow-brown, moist, pervious, dense.	(SP)
7.0 - 9.5	Sand, clean, fine, uniform, and sand moderately well-graded in alternate 1" to 2" layers, yellow-brown, moist, pervious, dense.	(SP-SW)
9.5 -12.0	Sands, clean, uniform, with alternating 1" to 3" layers of fine sand and coarse sand; pale yellow, moist, pervious, dense, 5-10% gravel.	(SP)
12.0 -13.5	Sand, clean, uniform, fine, sand pale yellow, moist, pervious, dense, 5-10% gravel.	(SP)
13.5 -15.5	Sand, clean, uniform, coarse, sand pale yellow, moist, pervious, dense, 5-10% gravel.	(SP)
15.5 -16.5	Sand, clean, uniform, fine, pale yellow, moist, pervious, dense, 5-10% gravel.	(SP)
16.5 -22.5	Sand, clean, uniform, mixed layers of fine and coarse sand; pale yellow, pervious, dense, 5-10% gravel.	(SP)
22.5 -26.5	Sand, uniform, medium to fine, pale yellow, moist, pervious, dense, stratified; stratifications' average dip is 10° S 45° E - approximately parallel to original surface of feature, 5-10% gravel.	(SP)
26.5 -29.5	Sand, very fine, silty; olive-gray; moist, very slightly plastic; stiff, impervious; water seep just above this silt layer.	(SM)

Profile included (SW) layers up to 6" thick; entire profile consists of mixed layers of fine and coarse sand; profile glaciofluvial in origin, little gravel in profile.

TP 104; [illegible]' Upstream B.STAT. 10+70; ELEV. 800.5

Depth	Description	Class
0.0 - 1.0	Topsoil: no surface stones apparent	
1.0 - 2.0	Sand, clean, medium, poorly-graded, yellow-moist; pervious, dense; 5% gravel.	(SP)
2.0 - 3.0	Sand, clean, poorly-graded to well-graded; pale gray; moist to dry; pervious, dense, 10% gravel.	(SP-SW)
3.0 - 5.5	Sand, clean, poorly-graded; pale yellow; moist; pervious; dense, medium-size sand grains.	(SP)
5.5 -11.0	Sand, clean, poorly-graded, medium; pale yellow; (with layers of well-graded sand) more moist than above horizons; dense; horizontal stratified layers 0.25" thick, subrounded grains.	(SP)
11.0 -13.5	Sand, clean, well-graded (with a few 3"-4" (SP) layers) pale yellow, moist; pervious; dense.	(SW)
13.5 -15.0	Sand, silty; pale olive-gray; moist; pervious to impervious; dense; non-plastic; 10% gravel; 7% stones over 3"; mottled, cemented layer near top of till.	(SM)

TP 105; 403' Upstream B.STAT., 1+00; ELEV. 813.8

Depth	Description	Class
0.0 - 1.0	Topsoil: 5-10 stones over 1 cubic yard per surface acre	
1.0 - 5.0	Sand, silty; pale gray-brown; moist; semi-pervious; dense; 10% gravel; 10% stones over 3"; 5% stones over 6"; slightly platy in place.	(SM)
5.0 -	Bedrock: schist and granitized gneiss of the Littleton formation; a pegmatite dike is intruded into the Littleton formation; strike N 60° E; Dip 85° in direction of N 30° W.	

Silt layer on top of bedrock. No water in hole April 24, 1963.
Depth of bedrock varies from 4-7'.
Soil material derived from sandy glacial till.

TP 106; 1068' Upstream B.STAT., 6+50; ELEV. 780.9

Depth	Description	Class
0.0 - 1.0	Topsoil: 10 stones over 1 cubic yard per surface acre	
1.0 - 3.5	Sand, silty, yellow-brown, moist, semi-pervious, firm; 10% gravel; 15% stones over 3"; 10% stones over 6".	(SM)
3.5 - 8.0	Sand, silty, yellow-brown, moist, semi-pervious, dense; 10% gravel; 10% stones over 3"; 5% stones over 6".	(SM)
8.0 -	Bedrock: horizontal dip; seep at top of ledge. April 25, 1963.	

Soil material derived from glacial till.

TP 107; 1138' Upstream B.STAT., 4+25; ELEV. 789.9

Depth	Description	Class
0.0 - 1.0	Topsoil: 10 stones over 1 cubic yard per surface acre	
1.0 - 4.0	Sand, silty, fine, slightly plastic, yellow-brown, moist, semi-pervious; firm; 10% gravel; 15% stones over 3"; 5% stones over 6".	(SM)
4.0 -10.0	Sand, silty; yellow-brown, moist, semi-pervious, dense, noticeable mica flakes, slight platiness, slight staining; 15% gravel; 10% stones over 3"; 5% stones over 6".	(SM)
10.0 -	Bedrock: strike N 20° E; dip in direction of N 35° W. (Pegmatite?)	

Stones subangular throughout profile:
Soil derived from glacial till.

TP 108; 1280' Upstream B.STAT., 9+08; ELEV. 782.0

Depth	Description	Class
0.0 - 1.0	Topsoil: 10-15 stones over 1 cubic ya per surface acre	
1.0 - 5.0	Sand, silty, yellow-brown, moist, dense, semi-pervious, 5% gravel; 10% stones over 3"; 5% stones over 6"; subangular to subrounded particles.	(SM)
5.0 -	Pegmatite; moderately sound, occasional fractures; some staining along fractures.	

Profile derived from glacial till.

TP 109; 1505' Upstream B.STAT., 10+70; ELEV. 7[illegible]

Depth	Description	Class
0.0 - 1.0	Topsoil: 10 stones over 1 cubic yard per surface acre	
1.0 - 7.5	Sand, silty, pale olive, moist, semi-pervious, dense, 5% gravel, 2% stones over 3", subangular to subrounded; 10% stones over 6".	(SM)
7.5 -	Bedrock: Littleton formation, biotite schist with garnets and hornblende?; strike N 20° E; 8[illegible]° dip N 35° W.	

Depth to ledge varies from 3.5' to 4.5' below ground surface.

On one face of pit there is a small lens of clean uniform sand (SP) 3.5-4.5' below surface.
Soil derived from glacial till.

TP 110; 1415' Upstream B.STAT., 12+55; ELEV. 7[illegible]

Depth	Description	Class
0.0 - 1.0	Topsoil: 10 stones over 1 cubic yard per surface acre	
1.0 - 6.5	Sand, silty; pale yellow-brown; moist semi-pervious; dense; 10% gravel; 10% [illegible] over 3"; 5% stones over 6"; stones [illegible] angular.	
6.5 -	Bedrock; schist and pegmatite (interc[illegible] in places due to contact metamorphism	

1 gallon/min. seep on top of ledge at 6.5' April 26, 1963.
Lense of (ML) on one face of pit.

TP 111; 1415' Upstream B.STAT., 14+70; ELEV. 7[illegible]

Depth	Description	Class
0.0 - 1.0	Topsoil; 10 stones over 1 cubic yard surface acre	
1.0 - 3.0	Sand, silty, pale olive; moist, semi-pervious; dense; 10% gravel; 10% ston[illegible] over 3"; 10% stones over 6". Contain[illegible] more silt than samples from other pit[illegible]	
3.0 - 8.0	Same as above except 10% stones over [illegible]	
8.0 -	Bedrock: Littleton formation, Strike N 45° W, dip N 45° E.	

TP 112; 990' Upstream B. STAT. 11+55; ELEV. 7[illegible]

Depth	Description	Class
0.0 - 1.0	Topsoil: 15-20 stones over 1 cubic yard per surface acre	
1.0 - 5.0	Sand, silty, pale. olive-brown, some mottling; moist; semi-pervious; dense; 20% gravel; 10% stones over 3"; 25% [illegible] over 6".	
5.0 - 7.0	Sand, silty, yellow-brown; moist; se[illegible] pervious; dense; 15% gravel; 15% ston[illegible] over 3".	
7.0 -12.0	Sand, silty, yellow-brown, moist to [illegible] semi-pervious, dense; 20% gravel; 40[illegible] stones over 3"; 10% stones over 6".	

Entire profile derived from glacial [illegible] all rock fragments in profile are ang[illegible] perhaps digging fractured ledge in bottom of hole.

TP 113; 928' Upstream B. STAT. 10+55; ELEV. 770.[illegible]

Depth	Description	Class
0.0 - 1.0	Topsoil: 15-20 stones over 1 cubic y[illegible] per surface acre	
1.0 - 4.0	Sand, silty, pale gray, moist, semi-pervious to impervious, dense; 10% gr[illegible] 40% stones over 3"; 30% stones over [illegible]	
4.0 -10.0	As above except 30% stones over 3"; [illegible] stones over 6".	
10.0 -	Bedrock: mica schist and quartzite, moderately sound, somewhat weathered, slight iron staining, occasional fra[illegible] tures, Strike N 65° E; variable dip (Littleton formation)	

Rocks in profile are angular to sub-angular; mica flakes apparent throug[illegible] profile.

TP 114; 846' Upstream B. STAT. 11+05; ELEV. 782.7

Depth	Description	Class
0.0 - 1.0	Topsoil: 25 stones over 1 cubic yard per surface acre	
1.0 - 5.0	Sand, silty; pale yellow-brown, mois[illegible] semi-pervious, dense; 5% gravel; 20% stones over 3"; 15% stones over 6".	
5.0 -12.5	Sand, silty; yellow-brown; moist, se[illegible] pervious, dense; 10% gravel; 15% sto[illegible] over 3"; 10% stones over 6".	

Entire profile derived from sandy gl[illegible] till. Bedrock or large boulders ma[illegible] digging difficult so excavation stop[illegible] at 12.5.

TP 115; 989' Upstream B. STAT. 4+30; ELEV. 797.2

Depth	Description	Class
0.0 - 1.0	Topsoil: 10 stones over 1 cubic yard per surface acre	
1.0 - 5.0	Sand, silty, gray, moist, semi-pervi[illegible] dense; 10% gravel; 15% stones over 3[illegible] 5% stones over 6".	
5.0 - 7.0	Sand, silty, bright yellow-gray, moi[illegible] semi-pervious, dense; 10% gravel; 1[illegible] stones over 3"; 5% stones over 6".	
7.0 -10.0	Pegmatite, soft, decomposed and weathered, Striking N 20° E, dipping direction of N 35° W.	

Silt (ML) lense, slightly plastic, [illegible] to 2' deep in one section of pit.
Soil material derived from glacial [illegible]

TP 115A; 925' Upstream B. STAT. 4+[illegible]; ELEV. 7[illegible]

Depth	Description	Class
0.0 - 1.0	Topsoil; 10 stones over 1 cubic yard per surface acre	
1.0 - 4.0	Sand, silty, gray, moist, slightly plastic, semi-pervious, dense; 10% gravel; 10% stones over 3"; 5% stone[illegible] over 6".	
4.0 -	Bedrock: pegmatite, soft, decomposed and weathered, Striking N 20° E, dipp[illegible] in direction of N 35° W.	

Soil material derived from glacial [illegible]

6

TP 110; 1410' Eastern R. STAT. 12+75; ELEV. 792.1

Depth	Description	Class
0.0 - 1.0	Topsoil: 10 stones over 1 cubic yard per surface acre	
1.0 - 6.5	Sand, silty; pale yellow-brown; moist, semi-pervious; dense; 10% gravel; 10% stones over 3"; 5% stones over 6"; stones sub-angular.	(SM)
6.5 -	Bedrock: schist and pegmatite (intergrown in places due to contact metamorphism)	

1 gallon/min. seep on top of ledge at 6.5' April 26, 1963.
Lense of (ML) on one face of pit.

TP 111; 1435' Eastern R. STAT. 14+70; ELEV. 791.7

Depth	Description	Class
0.0 - 1.0	Topsoil: 10 stones over 1 cubic yard per surface acre	
1.0 - 3.0	Sand, silty, pale olive; moist, semi-pervious; dense; 10% gravel; 20% stones over 3"; 20% stones over 6". Contains more silt than samples from other pits.	(SM)
3.0 - 8.0	Same as above except 10% stones over 3".	(SM) SM*
8.0 -	Bedrock: Littleton formation, Strike N 45° W, Dip N 45° E.	

TP 112; 980' Eastern R. STAT. 11+55; ELEV. 792.2

Depth	Description	Class
0.0 - 1.0	Topsoil: 15-20 stones over 1 cubic yard per surface acre	
1.0 - 5.0	Sand, silty, pale, olive-brown, common mottles; moist; semi-pervious; dense; 20% gravel; 30% stones over 3"; 25% stones over 6".	(SM)
5.0 - 7.0	Sand, silty, yellow-brown; moist; semi-pervious; dense; 15% gravel; 15% stones over 3".	(SM)
7.0 - 12.0	Sand, silty, yellow-brown, moist to wet, semi-pervious, dense; 20% gravel; 40% stones over 3"; 35% stones over 6".	(SM)

Entire profile derived from glacial till; all rock fragments in profile are angular, perhaps digging fractured ledge in bottom of hole.

TP 113; 980' Eastern R. STAT. 10+55; ELEV. 770.8

Depth	Description	Class
0.0 - 1.0	Topsoil: 15-20 stones over 1 cubic yard per surface acre	
1.0 - 4.0	Sand, silty, pale gray, moist, semi-pervious to impervious, dense; 10% gravel; 60% stones over 3"; 50% stones over 6".	(SM)
4.0 - 10.0	As above except 50% stones over 3"; 40% stones over 6".	
10.0 -	Bedrock: mica schist and quartzite, moderately sound, somewhat weathered, slight iron staining, occasional fractures. Strike N 85° E; variable dip (Littleton formation)	

Rocks in profile are angular to sub-angular; mica flakes apparent throughout profile.

TP 114; 865' Eastern R. STAT. 11+05; ELEV. 782.7

Depth	Description	Class
0.0 - 1.0	Topsoil: 15 stones over 1 cubic yard per surface acre	
1.0 - 5.0	Sand, silty; pale yellow-brown, moist, semi-pervious, dense; 5% gravel; 20% stones over 3"; 15% stones over 6".	(SM)
5.0 - 12.5	Sand, silty; yellow-brown; moist, semi-pervious, dense; 10% gravel; 15% stones over 3"; 10% stones over 6".	(SM) * SM

Entire profile derived from sandy glacial till. Bedrock or large boulders made digging difficult so excavation stopped at 12.5.

TP 115; 980' Eastern R. STAT. 4+30; ELEV. 787.9

Depth	Description	Class
0.0 - 1.0	Topsoil: 10 stones over 1 cubic yard per surface acre	
1.0 - 5.0	Sand, silty, gray, moist, semi-pervious, dense; 10% gravel; 15% stones over 3"; 5% stones over 6".	(SM)
5.0 - 7.0	Sand, silty, bright yellow-gray, moist, semi-pervious, dense; 10% gravel; 10% stones over 3"; 5% stones over 6".	(SM)
7.0 - 10.0	Pegmatite, sound, decomposed and weathered, Striking N 20° E, dipping in direction of N 55° W.	

Silt (ML) lense, slightly plastic, up to 8" deep in one section of pit.
Soil material derived from glacial till.

TP 116; [illegible] Eastern R. STAT. [illegible]; ELEV. 782.5

Depth	Description	Class
0.0 - 1.0	Topsoil: 10 stones over 1 cubic yard per surface acre	
1.0 - 4.0	Sand, silty, gray, moist, slightly plastic, semi-pervious, dense; 10% gravel; 10% stones over 3"; 5% stones over 6".	(SM)
4.0 -	Bedrock: pegmatite, sound, decomposed and weathered, Striking N 20° E, dipping in direction of N 55° W.	

Soil material derived from glacial till.

AH-116; [illegible]; ELEV. [illegible]

Depth	Description	Class
0.0 - 1.0	Topsoil	
1.0 - 10.0	Sand, clean, variable, medium to coarse, well-graded; pale yellow, slightly moist; 5% gravel, pervious, dense.	(SW)

AH-117; 540' Eastern R. STAT. 17+60; ELEV. 814.0

Depth	Description	Class
0.0 - 1.0	Topsoil	
1.0 - 2.5	Gravel, well-graded; clean, pale yellow; dry, pervious; dense; gravel pebbles show linear arrangement, stratified; regional dip.	(GW)
2.5 - 5.0	Sand, medium, well-graded, moist, pervious; dense; 10% gravel; becomes coarser with depth.	(SW)
5.0 - 6.0	Sand, clean, fine, uniform, yellow-brown, moist, more dense in place than above layers.	(SP)
6.0 - 9.0	Sand, coarse, clean, yellow-brown, dry, pervious.	(SP)
9.0 - 10.0	Sand, clean, fine, uniform, moist, pervious, more compact in place than coarse layers.	(SP)
10.0 - 11.5	Sand, clean, medium, well-graded, pale yellow-brown, dry, pervious, dense.	(SW)
11.5 - 17.0	Sand, clean, fine, uniform, yellow-brown, moist, pervious, dense.	(SP)
17.0 - 19.0	Sand, clean, medium to coarse, dry, pervious, dense; 15% gravel.	(SP)
19.0 - 22.0	Sand, clean, fine, uniform, moist, pervious, dense.	(SP)
22.0 -	(Profile continues with similar lithology for several feet)	

Entire profile is stratified; strike of strata is N 45° E; Dip is 17° in direction of S 45° E. Floor of pit appears to be gravel. Talus or colluvium near bottom of face prevented carrying description further.

AH-118; 370' Eastern R. STAT. 14+50; ELEV. 830

Depth	Description	Class
0.0 - 0.5	Topsoil	
0.5 - 1.5	Sand, poorly graded to well-graded; pale yellow-brown, dry, pervious, loose, sub-rounded particles; 10% fine to medium gravel.	(SP-GW)
1.5 - 5.0	Sand, medium; uniform; pale yellow-brown, dry; pervious; loose; less than 5% subrounded gravel.	(SP)
5.0 - 9.5	Gravel, well-graded, pale yellow-brown, slightly moist; pervious, medium density.	(GW)
9.5 - 11.0	Sand, medium, uniform, pale yellow-brown, slightly moist; pervious; medium density; no gravel or stones.	(SP)
11.0 - 13.0	Silt, pale brown; moist; semi-pervious; stiff; no gravel or stones; stands up in vertical faces, a lense that pinches and swells.	(ML)
13.0 - 15.0	Sand, fine with some silt; pale yellow; moist; pervious to semi-pervious; medium density.	(SP-SM)
15.0 -	Sand, well graded; variable, medium to coarse; light brown; slightly moist; pervious, medium density.	(SW)

No water table. September 10, 1963.
Profile described in existing sand pit.
Material is in a kame terrace. Profile continues for several more feet.

TP 201; 680' Eastern R. STAT. 7+00; ELEV. 775.1

Depth	Description	Class
0.0 - 1.0	Topsoil: 5 stones over 1 cubic yard per surface acre	
1.0 - 6.0	Sand, silty; pale olive gray, moist, semi-pervious, dense; 5% gravel; 5% stones over 3".	(SM)
6.0 - 7.0	Sand, silty, rusty, reddish-yellow, moist, impervious, dense to very dense, variable in location and thickness; slightly cemented with iron.	(SM)
7.0 - 12.0	Sand, silty, dark yellow-brown, moist, semi-pervious, dense; [illegible] than above layers; 10-15% gravel; 5-10% stones over 3".	(SM)
12.0 -	Bedrock or large boulders; seep on top of ledge (?) in bottom of pit.	

Water table at 7.0' April 25, 1963.
Pit filled with water and slumped more rapidly than other holes. Soil material derived from glacial till.

TP 202; 460' Eastern R. STAT. 7+40; ELEV. 760.3

Depth	Description	Class
0.0 - 1.0	Topsoil: 10 stones over 1 cubic yard per surface acre	
1.0 - 7.0	Sand, silty; pale olive; moist; semi-pervious; dense; 5-10% gravel; 10% stones over 3"; 5% stones over 6"; occasional large boulders in hole; rock fragments sub-angular to subrounded.	(SM)
7.0 -	Bedrock: nearly horizontal; small seep on top of ledge. April 25, 1963.	

Soil material derived from glacial till.

TP 203; 540' Eastern R. STAT. 4+95; ELEV. 792.3

Depth	Description	Class
0.0 - 1.0	Topsoil: 5 stones over 1 cubic yard per surface acre	
1.0 - 2.5	Sand, silty, reddish-brown, moist, semi-pervious, dense; 5% gravel; 5% stones over 3".	(SM)
2.5 - 14.0	Sand, silty, olive-brown, moist, semi-pervious, dense; 10% gravel; 5% stones over 3".	(SM)
14.0 -	Bedrock: pegmatite; thin silt layer on top of ledge, small seep on top of ledge. April 24, 1963.	

Entire profile derived from glacial till, dipping about 5° downhill.

TP 204; 400' Upstream R. STAT. 2+00; ELEV. 801.6

Depth	Description	Class
0.0 - 1.0	Topsoil: 5 stones over 1 cubic yard per surface acre	
1.0 - 4.0	Silt, yellow-brown, moist, impervious, firm, very little gravel, slightly plastic, no stones; pocket penetrometer reading 2.5 to 3.5 tons per sq. ft.	*ML (ML)
4.0 - 4.5	Silt, bright gray, moist, impervious, stiff, slightly plastic; localized.	(ML)
4.5 - 5.0	Sand, clean, fine, uniform, yellow, moist, semi-pervious, firm.	(SP)
5.0 - 10.0	Sand, silty, dark yellow-brown, wet, semi-pervious, dense; 5-10% stones over 3".	*SM (SM)
10.0 -	Bedrock or large stones.	

Soil material derived from glacial till.

TP 205; 373' Upstream R. STAT. 3+88; ELEV. 801.8

Depth	Description	Class
0.0 - 1.0	Topsoil: 5-10 stones over 1 cubic yard per surface acre.	
1.0 - 6.0	Sand, silty, pale yellow-brown; moist; semi-pervious; dense; 10% gravel; 5% stones over 3"; 2% stones over 6". 3/4 gpm seep @ 6 ft.	(SM)
6.0 - 14.0	Sand, silty, yellow-brown, wet, semi-pervious, dense; 10% gravel; 15% stones over 3"; 5% stones over 6".	*SP (SM)

Water table at 5.5' April 24, 1963.
Entire profile derived from sandy glacial till.

TP 206; 330' Upstream R. STAT. 1+58; ELEV. 809.7

Depth	Description	Class
0.0 - 1.0	Topsoil: 5 stones over 1 cubic yard per surface acre.	
1.0 - 6.0	Sand, silty, pale olive brown; moist, semi-pervious; dense; 5% gravel; 10% stones over 3"; 5% stones over 6".	(SM)
6.0 - 9.0	Pegmatite; moderately sound; somewhat weathered; slight rusty stains along fractures; close fractures: pegmatite emplaced in Littleton formation; upper 3' weathered enough to be excavated by backhoe (in this pit); roots penetrated up to 3' along fractures; pegmatite strike N 60° E; dip 14° N 30° W.	(SM)

Soil material derived from sandy glacial till.

TP 207; STAT. A+94, 4+64; ELEV. 806.0

Depth	Description	Class
0.0 - 1.0	Topsoil: 5-10 stones over 1 cubic yard per surface acre.	
1.0 - 8.0	Sand, silty, pale olive-brown, slightly moist, semi-pervious, dense; 5% gravel; 5-10% stones 3-24" in size; occasional stone over 1 cubic yard.	*SM (SM)
8.0 - 12.0	As above except moist, wet.	
12.0 -	Bedrock: horizontal dip; 10' along exposure in bottom of pit, non-weathered, occasional fracture. Seep in bottom, possibly bubbling out of fracture.	

Water table at 8.0' April 24, 1963.
All stones in profile subangular to subrounded. Profile derived from glacial till.

SM UNIFIED SOIL CLASSIFICATION BY LABORATORY

SOUHEGAN RIVER WATERSHED PROJECT
FLOODWATER RETARDING DAM NO. 25B
TEMPLE-WILTON, HILLSBOROUGH COUNTY, NEW HAMPSHIRE

LOGS OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Investigated by: R. [illegible]

NH-610-P

MAINTENANCE CHECKLIST FOR PL 566 FLOOD CONTROL STRUCTURES

This maintenance checklist is a guide for determining the maintenance required for Public Law 566 flood control structures in New Hampshire. It doesn't take the place of experience and judgment and is not inclusive. Items of a difficult nature to check, such as principal spillway conduit condition, are not included. Intensive checks of these items are necessary at proper intervals. Review of As Built drawings, the design folder, structure history, and previous maintenance reports should be part of the inspection. Prompt maintenance is a vital part of safe and effective operation.

Except where otherwise indicated, completion of this form may be facilitated by ranking maintenance items on a 1 to 4 basis where

1 = satisfactory
2 = satisfactory, but check carefully at next inspection
3 = requires maintenance this season
4 = requires immediate attention.

234.12

WATERSHED SQUHEGAN RIVER SITE 2SB DATE 5-19-77
INSPECTED BY KERR HUTCHINSON MACPHERSON
MILLIGAN KELSEA

1. GENERAL ITEMS

Access Road.	1
Site Fencing.	3
Traffic Conditions.	2
Vandalism Control.	2
Trash Control.	1

COMMENTS FENCE AND/OR GATE BETWEEN TOWN ROAD AND BORROW AREA DOWN. THERE IS EVIDENCE OF BULLYING ALONG TRAILS MADE BY TRAIL BIKES

2. RESERVOIR

Timber stand at reservoir.	2
Debris and slash.	2
Sediment level in relation to low stage inlet	

COMMENTS

5/77

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

EMBANKMENT AND EXCAVATED SLOPES

(Report riprap and vegetation and erosion condition under Items 4 and 5.)

	Dam	Dike (EM.SP)	Emergency Spillways left	Emergency Spillways right 1/	Other (____)	Other (____)
Sliding or sloughing	/	/	-	/	—	—
Holes (rodent and other) (check especially at embankments)	/	/	-	/	—	—
Excessive settlement (embankments)	/	/	-	/	—	—
Cracks						
Traverse	/	/	-	/	—	—
Longitudinal	/	/	-	/	—	—
Seepage 2/	/	/	-	/	—	—
Piping 2/	/	/	-	/	—	—

COMMENTS _____

4 RIPRAP

	Displ. of Rock	Loss of Spalls	Loss of Bedding	Erosion of Found.	Break-down of Rock
Dam					
Upstream berm	/	/	/	/	/
Principal Spillway Outlet	/	/	/	/	/
Embankment Gutters					
left DWNSTM	/	/	/	/	/
right UPSTM / DWNSTM	/ /	/ /	/ /	/ /	/ /
Emergency Spillway					
location _____	—	—	—	—	—
location _____	—	—	—	—	—
Waterways					
location _____	—	—	—	—	—
location _____	—	—	—	—	—
Outlet Channel	/	/	/	/	/
Other _____	—	—	—	—	—

COMMENTS _____

1/ Looking downstream.
2/ Check especially at downstream face of embankments.

4. VEGETATION

	Dam	Emergency Spillways left	Emergency Spillways right 1/	Dike	Outlet Channel	Water way	Other (_____)
Condition of stand (including need for lime and fertilizer)	3	—	3	—	NA	—	—
Undesirable vegetation	1	—	1	—	1	—	—
Drainage (surface)	NA	—	1	—	NA	—	—
Erosion 2/	1	—	1	—	1	—	—
Sedimentation	1	—	1	—	1	—	—
Condition of planting	NA	—	NA	—	NA	—	—
Pest control	—	—	—	—	—	—	—
Fire control	—	—	—	—	—	—	—

COMMENTS IF TREFOIL IS TO STAY, DAM AND SPILLWAY SHOULD BE LIMED AND FERTILIZED BASED ON THE RESULTS OF SOIL TESTS. GOOD TREFOIL POPULATION WANING VIGOR. POSSIBILITY OF WILDLIFE SHRUB PLANTINGS ON OUTLET SLOPES

5. EMBANKMENT, STRUCTURAL, & OTHER DRAINS

		Dam left	Dam right 1/	Other (____)	Other (____)
Depth of Flow (in inches above invert)	With any obstruction	—	—	—	—
	Without any obstruction	0	1/4	—	—
Turbidity of Discharge (yes, no)	With any obstruction	—	—	—	—
	Without any obstruction	NO	NO	—	—
Condition of Protective Coating	Outside	1	1	—	—
	Inside	1	1	—	—
Obstruction in Flow (yes, no)		NO	NO	—	—
Animal Guard Condition		1	1	—	—
Outlet Condition		1	1	—	—

Retarding Pool Elevation (ft. msl)_____ or_____(ft.) above / below _____

Other_____

COMMENTS_____

1/Looking downstream.
2/Including: wave, surface, stream, manmade, and livestock erosion.

7. RISER

	Caution Be extremely careful when using ladders. Check condition before using. Ladders are sometimes broken, loose, corroded, and or slippery. Use safety harness.
Ladders: inside and out	Condition of protective coating___; Corrosion___; Damaged parts___; Loose___; Other___.
Concrete: inside and out	Cracking___; Spalling___; Other deterioration ___; Excessive movement (check joint at riser and conduit)___; Other___.
Trashracks: low and high stage	Condition of protective coatings___; Corrosion ___; Damaged parts___; Condition of fastenings ___; Need of gratings due to beaver___; Safety condition (protruding fastenings, sharp edges, etc.)___; Other___.
Manhole:	Condition of protective coatings___; Corrosion ___; Damage___; Lock operable___; Other___.
Gate: including lifting device, stem, guides, disc	Condition of protective coating___; Corrosion ___; Damaged parts___; Condition of fastenings___; Stem alignment___; Lubrication___; Operation___; Other___.
Safety Items:	Condition of warning signs___; Condition of safety equipment___; Other___.

COMMENTS WATER RESOURCES BOARD PERSONNEL WILL CHECK RISER AND APPURTENANCES WHEN WATER RECEDES.

IMPACT BASIN, SAF, BOX INLET, & MISCELLANEOUS CONCRETE STRUCTURES

(specify)_____ _____

Concrete: inside and out	Cracking___; Spalling___; Other deterioration ___; Excessive movement (check joints)___; Waterstops___; Joint sealant___; Other___.
Trashracks: low and high stage	Condition of protective coatings___; Corrosion ___; Damaged parts___; Condition of fastenings___; Need of gratings due to beaver___; Safety condition (protruding fastenings, sharp edges, etc.)___; Other___.
Gates: including lifting device, stem, guides, disc, flap	Condition of protective coating___; Corrosion ___; Damaged parts___; Condition of fastenings___; Stem alignment___; Operation___; Lubrication___; Wood decay___; Other___.
Structure Drainage:	Report under "Embankment and Other Drains"
Structure, Railing, Grates, Barriers, etc.	Condition of protective coating___; Corrosion ___; Damaged parts___; Condition of Fastenings___; Wood decay___; Safety condition (protruding fastenings, sharp edges, etc.) ___; Other___.
Safety Items:	Condition of warning signs___; Condition of safety equipment___; Other___.

COMMENTS_____

_____

_____

_____

_____

_____

9. CHANNEL

Stream obstructions. . . . . /
Debris in stream. . . . . /
Sediment bars controlled. . . . . /
Plunge pool stability. . . . . /
Fish habitat appurtenances . . . . . ___
Riprap -- Report under "Riprap" (item 4)

COMMENTS_____

_____

_____

_____

_____

_____

MAINTENANCE CHECKLIST FOR PL 566 FLOOD CONTROL STRUCTURES

This maintenance checklist is a guide for determining the maintenance required for Public Law 566 flood control structures in New Hampshire. It doesn't take the place of experience and judgment and is not inclusive. Items of a difficult nature to check, such as principal spillway conduit condition, are not included. Intensive checks of these items are necessary at proper intervals. Review of As Built drawings, the design folder, structure history, and previous maintenance reports should be part of the inspection. Prompt maintenance is a vital part of safe and effective operation.

Except where otherwise indicated, completion of this form may be facilitated by ranking maintenance items on a 1 to 4 basis where

1 = satisfactory
2 = satisfactory, but check carefully at next inspection
3 = requires maintenance this season
4 = requires immediate attention.

WATERSHED Souhegan River SITE 25B 23A-L DATE 6/16/78

INSPECTED BY Kerr, Fife(NHWRB), Hutchinson, Wenninger(SCS)

1. GENERAL ITEMS

Access Road.	
Site Fencing.	
Traffic Conditions.	
Vandalism Control.	1
Trash Control.	1

COMMENTS

2. RESERVOIR

Timber stand at reservoir.	1
Debris and slash.	1
Sediment level in relation to low stage inlet	1

COMMENTS

SOIL CONSERVATION SERVICE
US DEPARTMENT OF AGRICULTURE

2. EMBANKMENT AND EXCAVATED SLOPES

(Report riprap and vegetation and erosion condition under Items 4 and 5.)

	Dam	Dike	Emergency Spillways 1/ left	Emergency Spillways 1/ right	Other (____)	Other (____)
Sliding or sloughing	1	1	—	1	—	—
Holes (rodent and other)	1	1	—	3	—	—
(check especially at embankments)	1					
Excessive settlement (embankments)	—	1	—	1	—	—
Cracks						
Traverse	1	1	—	1	—	—
Longitudinal	1	1	—	1	—	—
Seepage 2/	1	1	—	1	—	—
Piping 2/	1	1	—	1	—	—

COMMENTS Fill holes at ES outlet waste area

4. RIPRAP

	Displ. of Rock	Loss of Spalls	Loss of Bedding	Erosion of Found.	Breakdown of Rock
Dam					
Upstream berm	—	—	—	—	—
Principal Spillway Outlet	1	1	1	1	1
Embankment Gutters					
left	1	1	1	1	1
right	1	1	1	1	1
Emergency Spillway N/A					
location_____	—	—	—	—	—
location_____	—	—	—	—	—
Waterways					
location_____	—	—	—	—	—
location_____	—	—	—	—	—
Outlet Channel	—	—	—	—	—
Other_____	—	—	—	—	—

COMMENTS

1/Looking downstream.
2/Check especially at downstream face of embankments.

5. VEGETATION

	Dam	Emergency Spillways left	Emergency Spillways right 1/	Dike	Outlet Channel	Water way	Other (_____)
Condition of stand (including need for lime and fertilizer)	3	—	3	—	—	—	—
Undesirable vegetation	1	—	2	—	—	—	—
Drainage (surface)	1	—	1	—	—	—	—
Erosion 2/	1	—	1	—	—	—	—
Sedimentation	1	—	1	—	—	—	—
Condition of planting	1	—	1	—	—	—	—
Pest control	1	—	1	—	—	—	—
Fire control	1	—	1	—	—	—	—

COMMENTS See recommendations given last spring on lime and fertilizer. Special attention to be given to area below berm on downstream side of dam and floor of ES

6. EMBANKMENT, STRUCTURAL, & OTHER DRAINS

		Dam left	Dam right 1/	Other (_____)	Other (_____)
Depth of Flow (in inches above invert)	With any obstruction	3	—	—	—
	Without any obstruction	—	½"	—	—
Turbidity of Discharge (yes, no)	With any obstruction	—	—	—	—
	Without any obstruction	—	no	—	—
Condition of Protective Coating	Outside	1	1	—	—
	Inside	1	1	—	—
Obstruction in Flow (yes, no)		no	no	—	—
Animal Guard Condition		1	1	—	—
Outlet Condition		1	1	—	—

Retarding Pool Elevation (ft. msl)_____ or_____(ft.) above / below _____

Other_____

COMMENTS No flow out of drain outlet above plunge pool. From sound it appears flow is OK at left drain going into plunge pool - should check flow from manholes and condition of pipe.

1/Looking downstream.
2/Including wave, surface, stream, manmade, and livestock erosion

RISER

	Caution Be extremely careful when using ladders. Check condition before using. Ladders are sometimes broken, loose, corroded, and or slippery. Use safety harness.
Ladders: inside and out	Condition of protective coating 1 ; Corrosion 1 ; Damaged parts 1 ; Loose 1 ; Other ___.
Concrete: inside and out	Cracking 1 ; Spalling 1 ; Other deterioration 1 ; Excessive movement (check joint at riser and conduit) ___; Other ___.
Trashracks: low and high stage	Condition of protective coatings 1 ; Corrosion 1 ; Damaged parts 1 ; Condition of fastenings 1 ; Need of gratings due to beaver ___; Safety condition (protruding fastenings, sharp edges, etc.) ___; Other ___.
Manhole:	Condition of protective coatings ___; Corrosion ___; Damage ___; Lock operable ___; Other ___.
Gate: including lifting device, stem, guides, disc	Condition of protective coating ___; Corrosion ___; Damaged parts ___; Condition of fastenings ___; Stem alignment ___; Lubrication ___; Operation ___; Other ___.
Safety Items:	Condition of warning signs ___; Condition of safety equipment ___; Other ___.

COMMENTS Inside of riser should be checked and gate operated at determined intervals. Not done during this inspection.

IMPACT BASIN, SAF, BOX INLET, & MISCELLANEOUS CONCRETE STRUCTURES

(specify)_____ _____

Concrete: inside and out	Cracking___; Spalling___; Other deterioration ___; Excessive movement (check joints)___; Waterstops___; Joint sealant___; Other___.
Trashracks: low and high stage	Condition of protective coatings___; Corrosion ___; Damaged parts___; Condition of fastenings___; Need of gratings due to beaver___; Safety condition (protruding fastenings, sharp edges, etc.)___; Other___.
Gates: including lifting device, stem, guides, disc, flap	Condition of protective coating___; Corrosion ___; Damaged parts___; Condition of fastenings___; Stem alignment___; Operation___; Lubrication___; Wood decay___; Other___.
Structure Drainage:	Report under "Embankment and Other Drains"
Structure, Railing, Grates, Barriers, etc.	Condition of protective coating___; Corrosion ___; Damaged parts___; Condition of Fastenings___; Wood decay___; Safety condition (protruding fastenings, sharp edges, etc.) ___; Other___.
Safety Items:	Condition of warning signs___; Condition of safety equipment___; Other___.

COMMENTS_____

9. CHANNEL

Stream obstructions.	1
Debris in stream.	1
Sediment bars controlled.	1
Plunge pool stability.	1
Fish habitat appurtenances	-
Riprap -- Report under "Riprap" (item 4)	

COMMENTS_____

The U.S.D.A. Soil Conservation Service (SCS) located in Durham, New Hampshire, maintains a file for this dam. Included in this file are:

1) SCS "Design Report" dated June 1969.

2) SCS "Hydrology and Hydraulics" design calculations dated 1967.

3) SCS structural design calculations dated 1969.

4) SCS "Detailed Geological Investigation of Dam Sites" dated 1963.

5) SCS soil mechanics laboratory data sheets dated 1964.

6) SCS "As Built" drawings dated 1967.

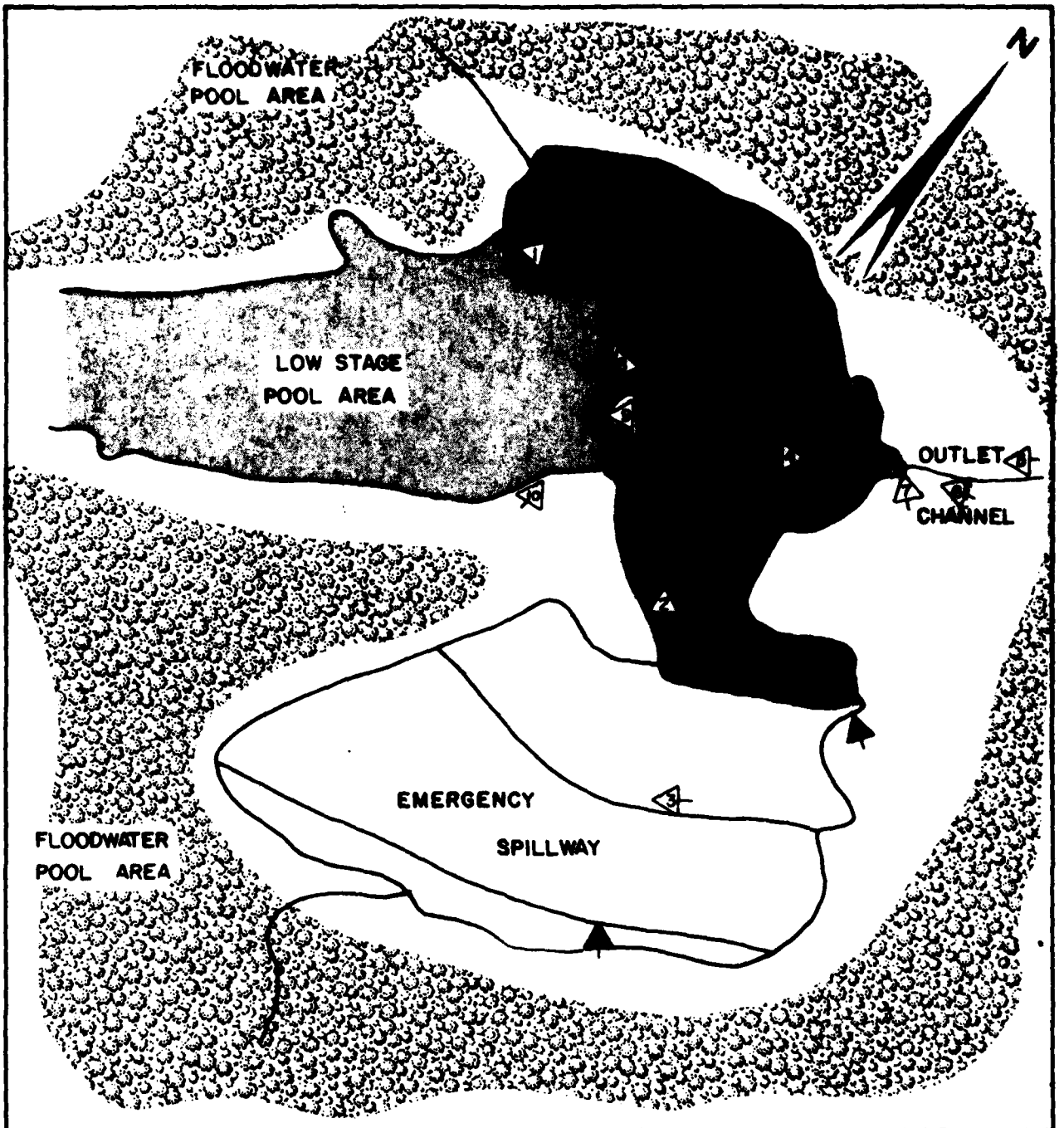
7) Stability of materials and settlement calculations dated 1969.

The New Hampshire Water Resources Board (NHWRB) maintains a correspondence file on this dam. Included in this file are:

1) Maintenance inspection checklists dated May 19, 1977 and June 16, 1978.

APPENDIX C

PHOTOGRAPHS



GOLDBERG, ZOINO, DUNNCLIFF & ASSOC., INC.
GEOTECHNICAL CONSULTANTS
NEWTON UPPER FALLS, MASS.

U.S. ARMY ENGINEER DIV. NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

LOCATION AND ORIENTATION OF PHOTOS

SOUHEGAN RIVER WATER SHED
DAM No. 25b
NEW HAMPSHIRE

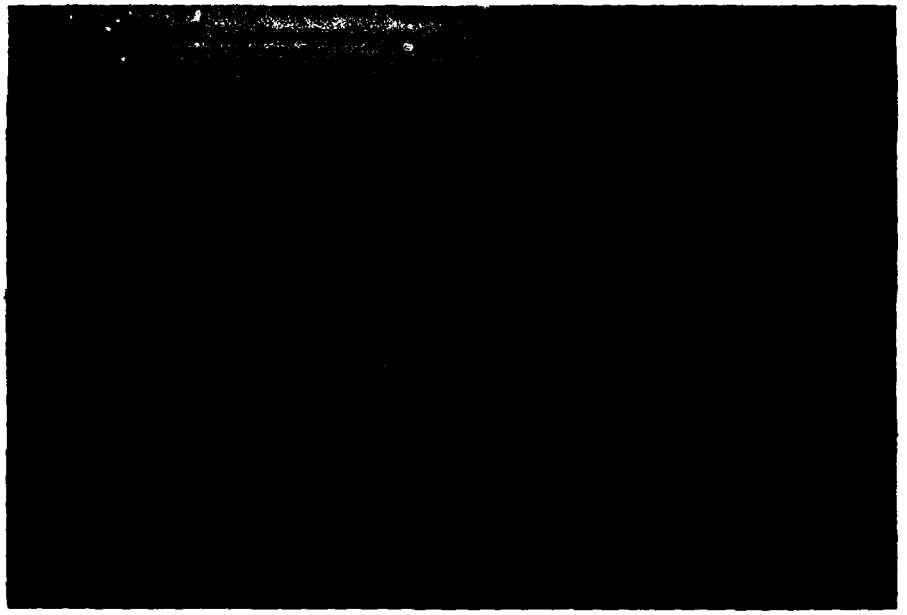
OVERVIEW

APPENDIX C

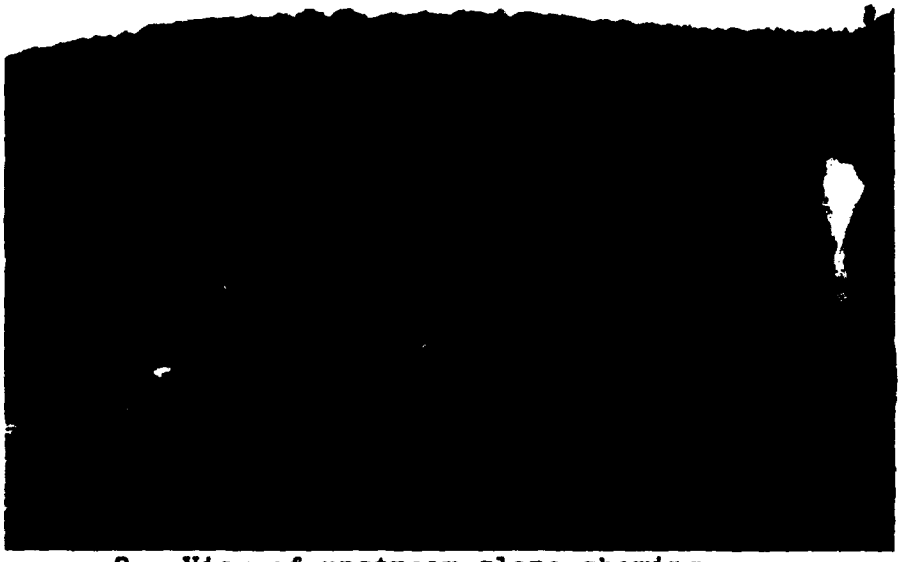
FILE No. 2327

SCALE 1" = 800'

DATE JULY 1978



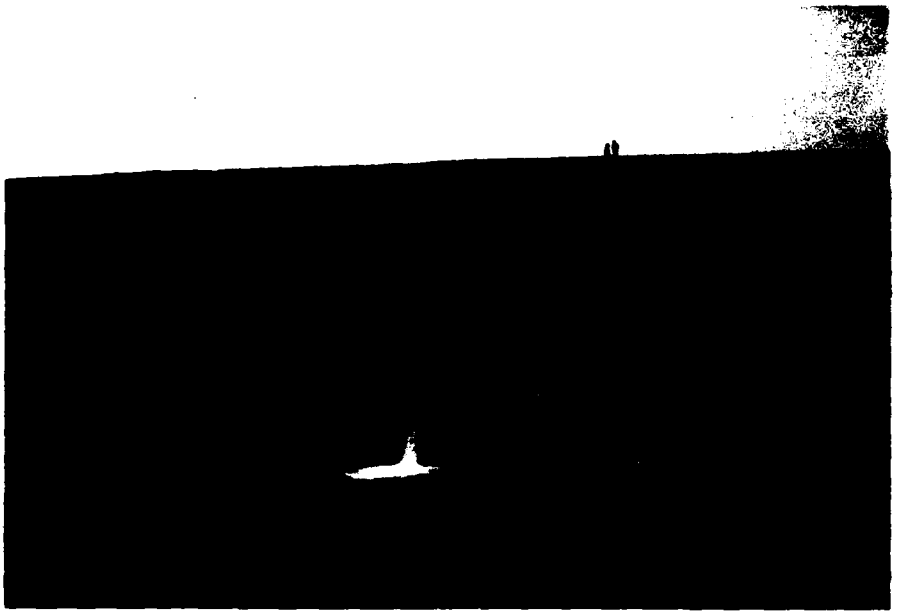
1. View of upstream slope showing rip rap protection and drop inlet riser structure



2. View of upstream slope showing debris on slope

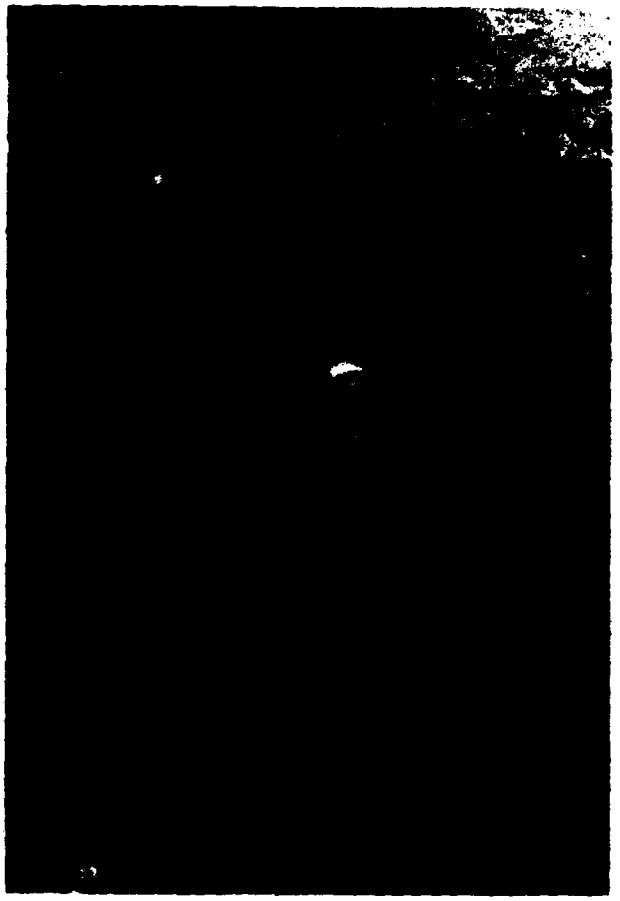
3. View of emergency spillway from right abutment looking upstream

4. View of downstream channel showing rip rap protection of plunge pool



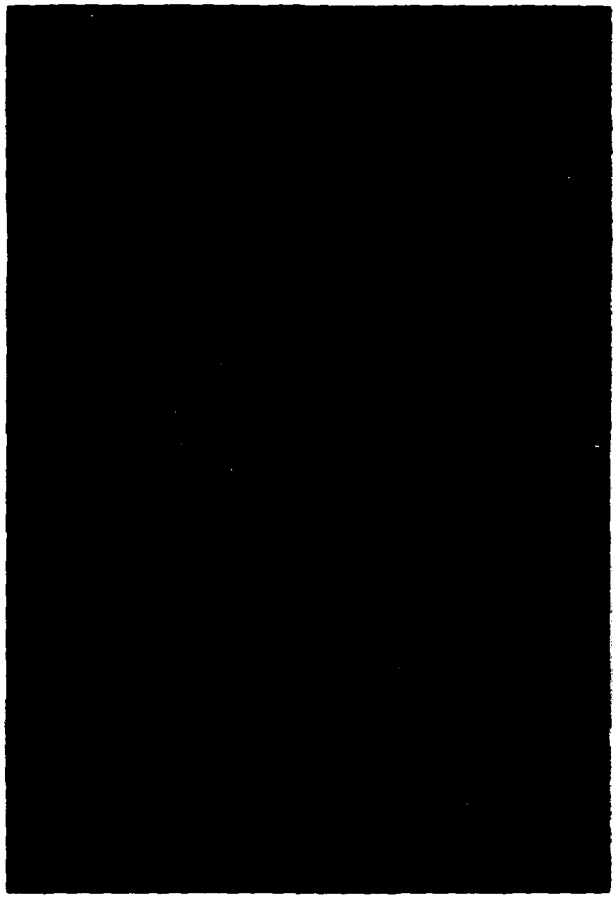
5. View of downstream slope showing rip rap protection of drainage channel and outlet pipe

6. View of outlet pipe showing support cradle

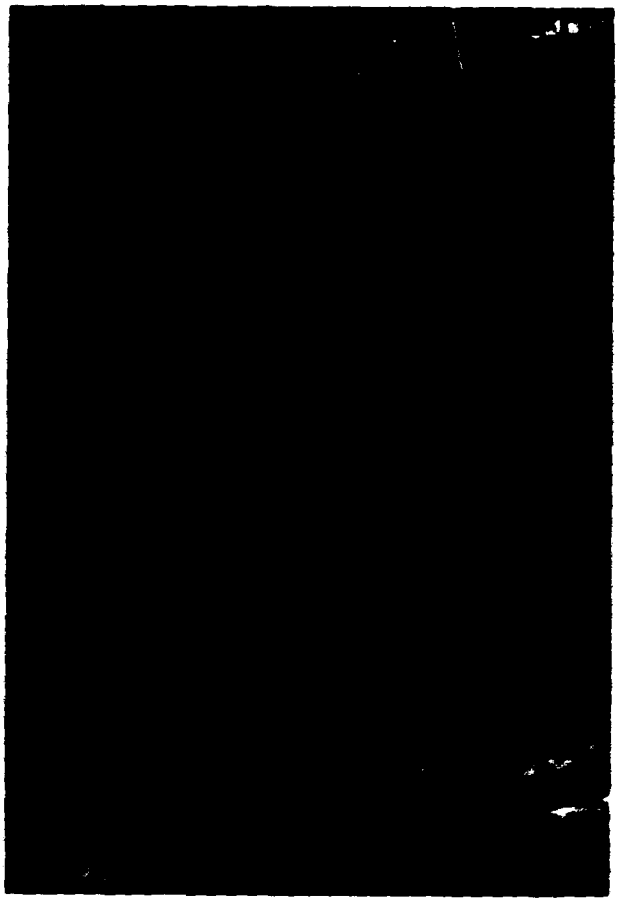


7. Close up of efflorescence on outlet pipe support cradle

8. Close up of honeycombing on drop inlet structure



9. View of downstream side of drop inlet structure showing short ladder

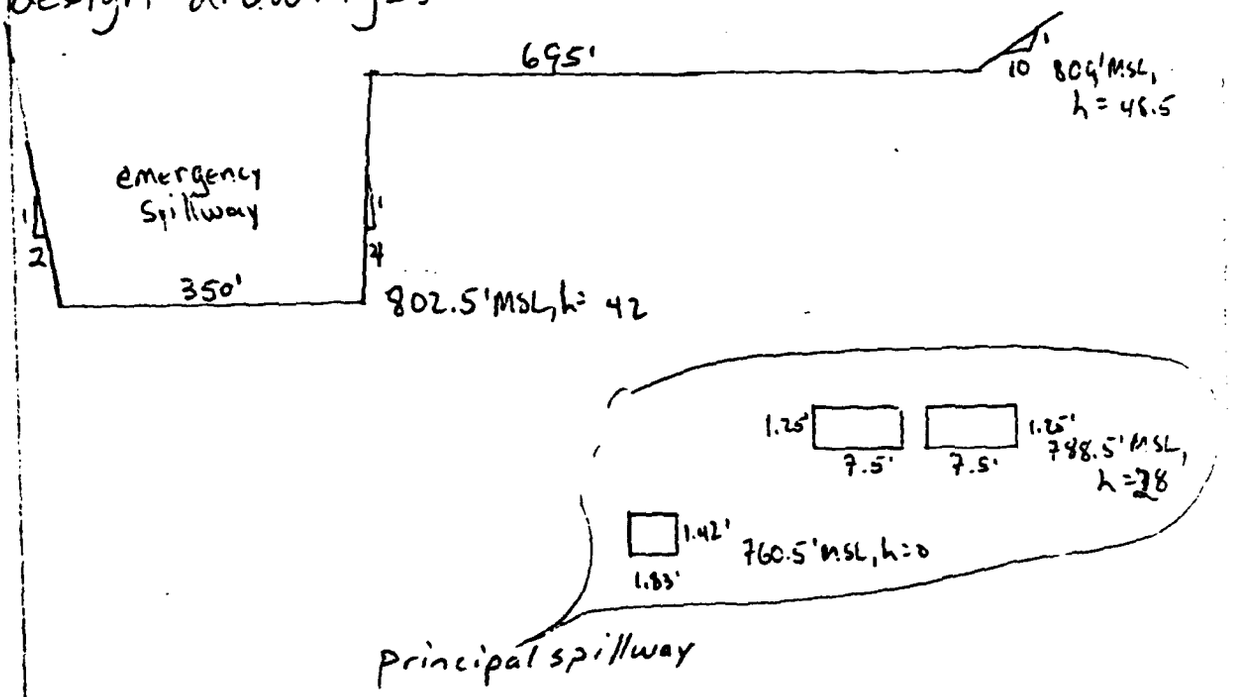


10. View of upstream and right sides of drop inlet structure showing debris in low stage trash rack

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

The information used to establish this elevation of Souhegan River Watershed Dam #253 was determined from field notes and S.C.S. design drawings.



The 1.83' x 1.42' orifice and the 2 - 7.5' x 1.25' orifices are on a riser structure in the reservoir. Their flow combines and travels under the reservoir in a 345.3' long 30" reinforced concrete pipe (u/s invert = 750' MSL, d/s = 745' MSL).

There is one other source of outflow - a "pond drain inlet" with invert at 751.5' which is about 50' of 24" r.c.p. The inlet is controlled by a gate operated from the top of the riser, and is generally closed. When it

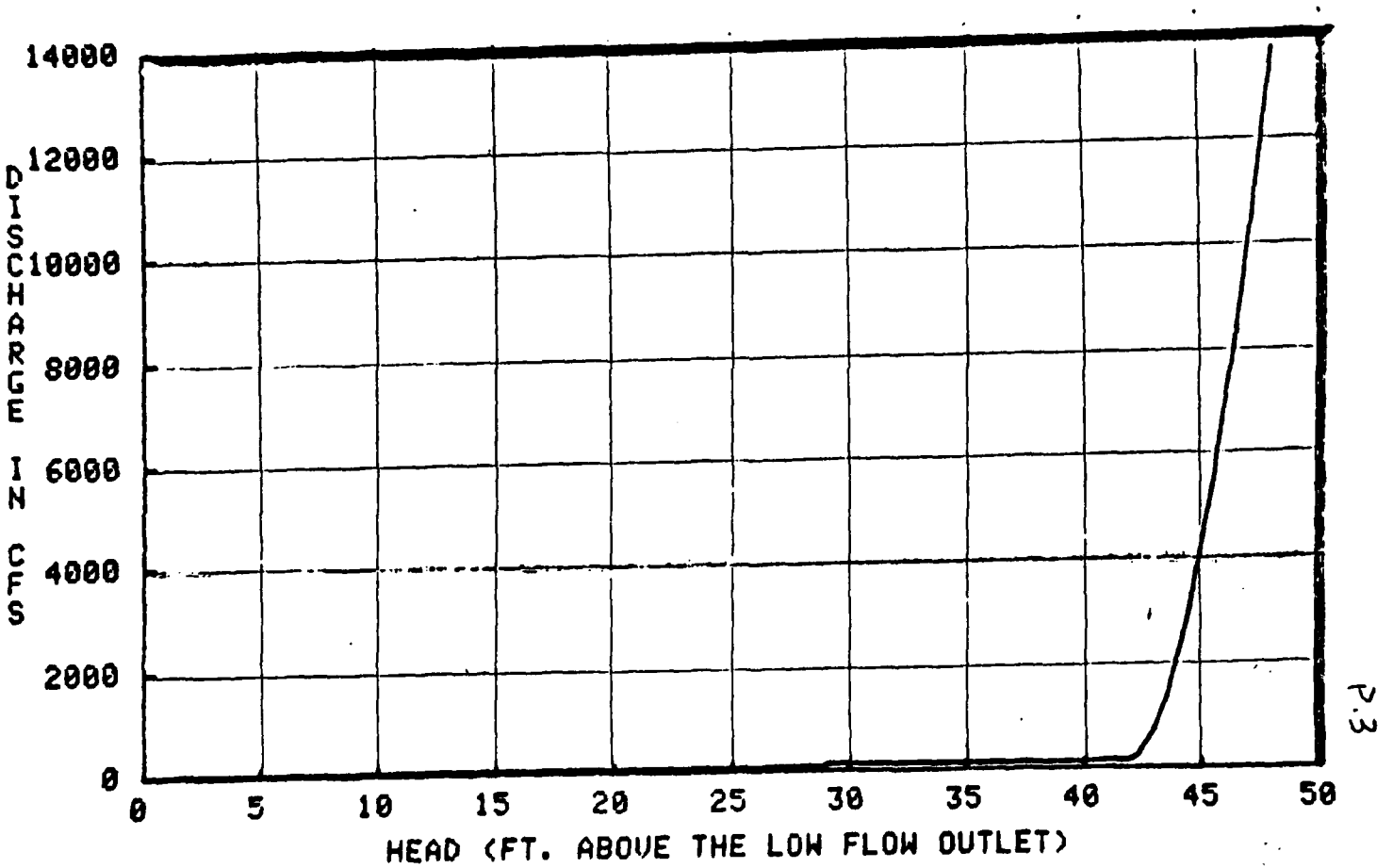
D-2

is open, its flow goes under the dam through the 30" rcp. For these calculations the pond drain inlet is assumed to be closed.

The S.C.S. has developed a stage-discharge curve for this dam (from p. 22/33, S.C.S. calculations, dated 12/12/67).

elevation (Ft. MSL)	Stage (h) (Ft. above low flow outlet)	Principal Spillway Discharge (cfs)	Emergency Spillway Discharge (cfs)	Total Discharge (cfs)
760.5	0	0	0	0
760.9	.4	1	0	1
761.2	.7	3	0	3
761.5	1.0	6	0	6
761.8	1.3	8	0	8
762.2	1.7	12	0	12
763	2.5	17	0	17
769	8.5	35	0	35
774	13.5	45	0	45
780	19.5	54	0	54
788.5	28.5	65	0	65
788.9	28.9	78	0	78
789.6	29.1	121	0	121
789.8	29.3	122	0	122
790.5	30.0	123	0	123
792	31.5	125	0	125
794	33.5	126	0	126
797	36.5	132	0	132
800	39.5	136	0	136
802.5	42.0	139	42	181
802.6	42.1	139	122.5	262
802.8	42.3	134	245	384
803	42.5	139.5	630	770
803.5	43.0	140	1225	1366
804	43.5	140.5	2012.5	2154
804.5	44.0	141	2975	3117
805	44.5	142	4095	4237
805.6	45.0	142	5372.5	5515
806	45.5	143	8312.5	8457
807	46.5	144	11812.5	11956
808	47.5	145		12301

STAGE-DISCHARGE CURVE FOR SOUHEGAN R. W. DAM # 25B



P.3

Storage-Elevation Curve:

This curve is given on p. 7/33 of the S.C.S. "Hydrologic and Hydraulic Calculations", dated 5/16/63.

elevation (Ft. MSL)	Stage (h) (Ft. above Low flow Outlet)	Current Storage (Ac-Ft.)	Available Storage (after 50 yr. sed) (Ac-Ft.)
760.5	0	36.1	0
762	1.5	46.7	6.1
766	5.5	79.2	35.0
770	9.5	121	73.5
774	13.5	176	126
778	17.5	248	196
782	21.5	341	288
786	25.5	454	400
790	29.5	588	534
794	33.5	747	693
798	37.5	936	883
802	41.5	1162	1108
806	45.5	1425	1371
810	49.5	1700 *	1635*

* = extrapolation

The storage-Elevation curve is given on p. 5.

For the drainage area of 3450 acres, 1 inch of runoff = 1/12 (3450) = 287.5 ac-ft.

$$1 \text{ Ac Ft} = \frac{1}{287.5} = .00348'' \text{ of runoff}$$

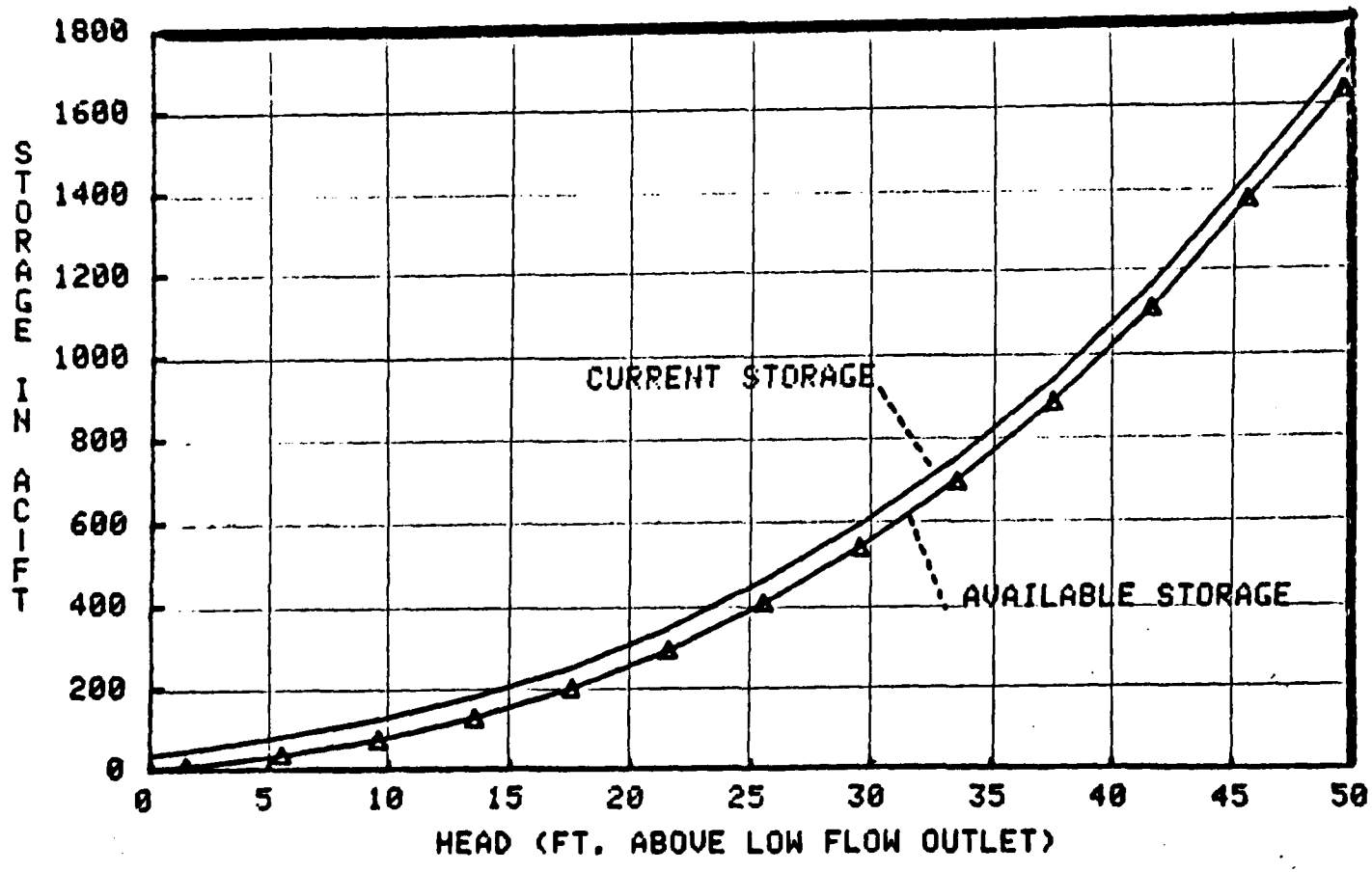
Current Storage to Em. spillway

= 1195 (.00348) = 4.16"

Current storage to Dam crest

= 1631 (.00348) = 5.68"

STORAGE-ELEVATION CURVE FOR SOUHEGAN R. W. DAM # 25-B



Dam Failure Analysis

Pg. 36 is a location and downstream hazard map for S.R.W.D. #25-B.

The first question to be addressed in the Dam Failure Analysis is the assumed water surface elevation at failure. The normal assumption is that failure occurs with the water surface at the top of the dam. This would create a pre-failure outflow of 15,600 cfs ± (extrapolation from curve on p. 3), which is much greater than the PMF outflow at the dam. This flow would create severe flooding downstream prior to dam failure. Dam failure would have a greater incremental impact on flooding if it were to occur with a lower water surface elevation in the reservoir. Therefore, for this analysis failure is assumed to occur with the water surface at the SCS Design High Water, 806 ft. MSL, h = 45.5, 3 ft. below the dam crest. This represents 3.5 ft of flow in the emergency spillway, and a pre-failure outflow of 5515 cfs. : Current storage at this level is 1425 ac-ft.

Peak Dam Failure Outflow = Normal Outflow + Breach outflow

Normal outflow = 5515 cfs

Breach outflow = $Q_{p_1} = 8/27\sqrt{g}\ W_b\ y_o^{3/2}$

where: W_b = breach width = 40% of width at ½ height of dam
= .4(525) = 210 ft. (Width from sheet 4 of SCS plans)

y_0 = height above tailwater at time of failure.

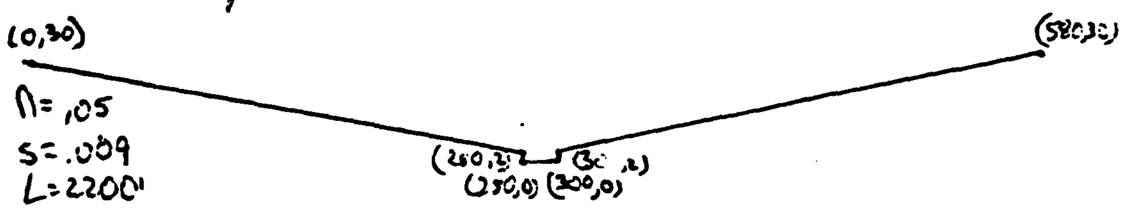
The Emergency Spillway outflow for SRWD # 25-B would not feed back to Temple Brook immediately. The flow is in a separate channel and rejoins the brook several hundred feet downstream. Therefore, tailwater is affected only by the principal spillway flow of about 143 cfs (at the failure elevation of 806' MSL). This would create only a small flow in a channel excavated below natural ground. Therefore, will use the natural ground elevation at the ℄ of the dam (747 ft. MSL) to determine y_0.

$$y_0 = 806 - 747 = 59 \text{ ft.}$$

$$Q_{p1} = \frac{8}{27}\sqrt{g}\ 210\,(59)^{3/2} = 160{,}000 \text{ cfs}$$

Peak dam failure outflow = 160,000 + 5500 = 165,500 cfs

For the first 2200' of natural channel downstream of the dam, the channel is relatively flat. The only development along Temple Brook in this reach is a country road (paved) which sometimes approaches fairly close to the stream. The following cross-section for the reach is based on field notes and USGS topo information:

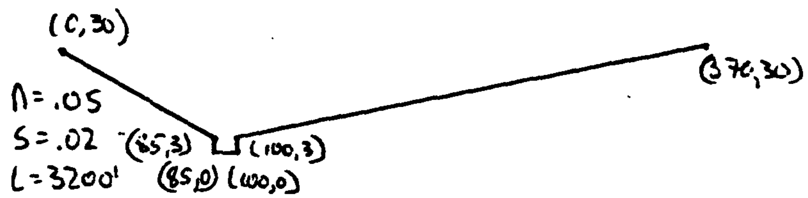


n = .05
S = .009
L = 2200'

A Stage-Normal Flow relationship for this reach is given on p. 10. At the pre-failure outflow of 5500 cfs, there would be 9.4 ft. of flow in this reach. The attenuation due to storage is calculated on p. 11.

The attenuated peak failure outflow 2400 ft. downstream of the dam is 124,700 cfs, which creates 28.7 ft. of flow in this reach. This would severely overtop the road between West Wilton and Temple in some parts.

From 2400' downstream of the dam to the confluence of Temple and Blood Brooks Temple Brook runs through a steeper and narrower channel for about 3200'. The following typical cross-section is based on field notes and U.S.G.S. topo information.



A Stage-Normal Flow relationship for this reach is given on p. 12. At the pre-failure outflow of 5500 cfs, there would be 10.2 ft. of flow in the channel. The attenuation due to storage in this reach is calculated on p. 13.

The attenuated peak dam failure outflow at the confluence of Temple and Blood Brooks is 100,300 cfs, which creates a stage of 27.6 ft. at this point.

At the downstream end of this reach there is a bridge on a secondary road with a low chord 20 ft.

DEPTH	ELEV	AREA	WPER	HYD-R	AR2/3	Q
0.00	0.0	0.0	0.0	0.0	0.0	0.0
1.00	1.0	20.0	22.0	0.9	18.8	53.1
2.00	2.0	40.0	24.0	1.7	56.2	159.0
3.00	3.0	70.0	44.1	1.6	95.3	269.3
4.00	4.0	120.0	64.2	1.9	182.1	514.9
5.00	5.0	190.0	84.3	2.3	326.7	923.6
6.00	6.0	280.0	104.4	2.7	540.7	1528.5
7.00	7.0	390.0	124.5	3.1	835.3	2361.4
8.00	8.0	520.0	144.6	3.6	1221.1	3452.1
9.00	9.0	670.0	164.7	4.1	1708.2	4829.2
10.00	10.0	840.0	184.8	4.5	2306.1	6519.6
11.00	11.0	1030.0	204.9	5.0	3024.2	8549.5
12.00	12.0	1240.0	225.0	5.5	3871.1	10943.8
13.00	13.0	1470.0	245.1	6.0	4855.4	13726.7
14.00	14.0	1720.0	265.2	6.5	5985.6	16921.7
15.00	15.0	1990.0	285.3	7.0	7269.5	20551.5
16.00	16.0	2280.0	305.4	7.5	8715.1	24638.3
17.00	17.0	2590.0	325.5	8.0	10330.1	29203.8
18.00	18.0	2920.0	345.6	8.4	12121.8	34269.3
19.00	19.0	3270.0	365.7	8.9	14097.8	39855.4
20.00	20.0	3640.0	385.8	9.4	16265.1	45982.6
21.00	21.0	4030.0	405.9	9.9	18630.8	52670.7
22.00	22.0	4440.0	426.0	10.4	21201.9	59939.4
23.00	23.0	4870.0	446.1	10.9	23985.2	67807.9
24.00	24.0	5320.0	466.2	11.4	26987.4	76295.3
25.00	25.0	5790.0	486.3	11.9	30215.1	85420.3
26.00	26.0	6280.0	506.4	12.4	33674.8	95201.2
27.00	27.0	6790.0	526.5	12.9	37373.0	105656.2
28.00	28.0	7320.0	546.6	13.4	41316.0	116803.3
29.00	29.0	7870.0	566.7	13.9	45510.0	128660.2
30.00	30.0	8440.0	586.8	14.4	49961.3	141244.3

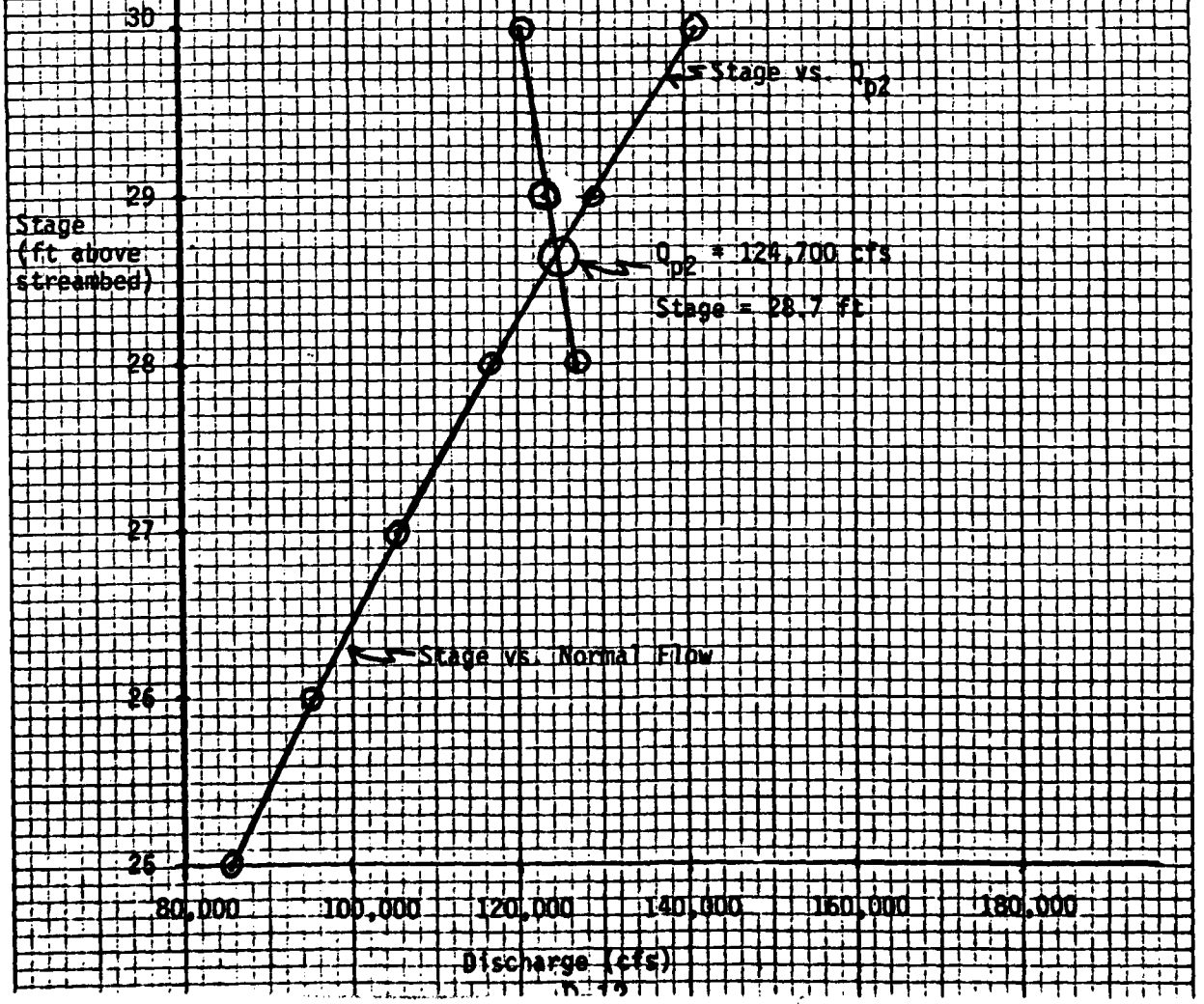
REACH FROM 200 FT. DOWNSTREAM OF DAM TO 2400 FT. DOWNSTREAM OF DAM

P.10

Attenuated Peak Dam Failure Flow 2400 ft Downstream TCG, 6/20/79, p. 11

$$Q_{p2} = Q_{p1}\left(1 - \frac{STOR}{1425}\right) = 165{,}500\left(1 - \frac{STOR}{1425}\right)$$

Stage (ft)	Area (above 9.4 ft) (sq ft)	Storage $\left(\frac{AREA \times 2200}{43{,}560}\right)$ (ac ft)	Q_{p2} (cfs)
28	6582	332	127,000
29	7132	360	123,700
30	7702	389	120,300



DEPTH	ELEV	AREA	WPER	HYD-R	AR2/3	Q
0.00	0.0	0.0	0.0	0.0	0.0	0.0
1.00	1.0	15.0	17.0	0.9	13.8	58.2
2.00	2.0	30.0	19.0	1.6	40.7	171.5
3.00	3.0	45.0	21.0	2.1	74.8	315.3
4.00	4.0	66.6	34.4	1.9	103.5	436.2
5.00	5.0	101.3	47.7	2.1	167.4	705.4
6.00	6.0	149.2	61.1	2.4	270.7	1140.6
7.00	7.0	210.2	74.4	2.8	420.1	1770.6
8.00	8.0	284.4	87.8	3.2	622.8	2624.9
9.00	9.0	371.7	101.1	3.7	885.6	3732.1
10.00	10.0	472.1	114.5	4.1	1214.8	5119.7
11.00	11.0	585.7	127.8	4.6	1616.8	6813.7
12.00	12.0	712.5	141.2	5.0	2097.5	8839.6
13.00	13.0	852.4	154.5	5.5	2662.7	11221.4
14.00	14.0	1005.5	167.9	6.0	3317.9	13982.8
15.00	15.0	1171.7	181.2	6.5	4068.6	17146.6
16.00	16.0	1351.0	194.6	6.9	4920.1	20734.9
17.00	17.0	1543.5	207.9	7.4	5877.3	24769.2
18.00	18.0	1749.2	221.3	7.9	6945.5	29270.8
19.00	19.0	1968.0	234.6	8.4	8129.4	34260.1
20.00	20.0	2199.9	248.0	8.9	9433.8	39757.4
21.00	21.0	2445.0	261.4	9.4	10863.5	45782.5
22.00	22.0	2703.2	274.7	9.8	12423.0	52354.8
23.00	23.0	2974.6	288.1	10.3	14116.8	59493.3
24.00	24.0	3259.2	301.4	10.8	15949.5	67216.9
25.00	25.0	3556.9	314.8	11.3	17925.4	75543.9
26.00	26.0	3867.7	328.1	11.8	20048.8	84492.6
27.00	27.0	4191.7	341.5	12.3	22323.9	94080.9
28.00	28.0	4528.8	354.8	12.8	24755.0	104326.5
29.00	29.0	4879.1	368.2	13.3	27346.2	115246.7
30.00	30.0	5242.5	381.5	13.7	30101.6	126858.9

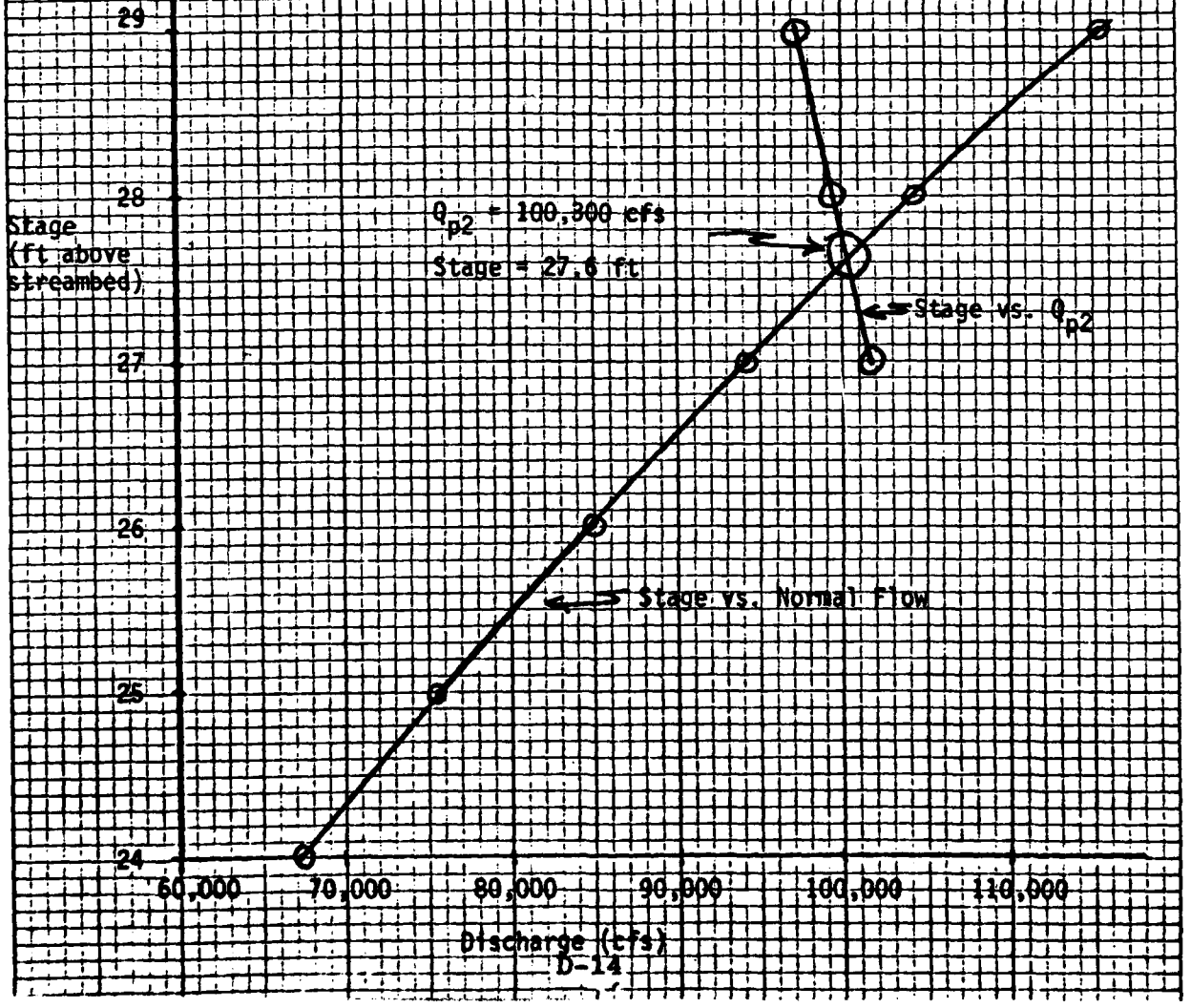
REACH FROM 2400 FT. DOWSTREAM OF DAM TO CONFLUENCE WITH BLOOD BROOK

Attenuated Peak Dam Failure Flow at Confluence of Temple and Blood Brooks

$$Q_{p2} = Q_{p1}\left(1 - \frac{STOR}{1425}\right) = 124{,}700\left(1 - \frac{STOR}{1425}\right)$$

TCG. 6/20/79, p. 13

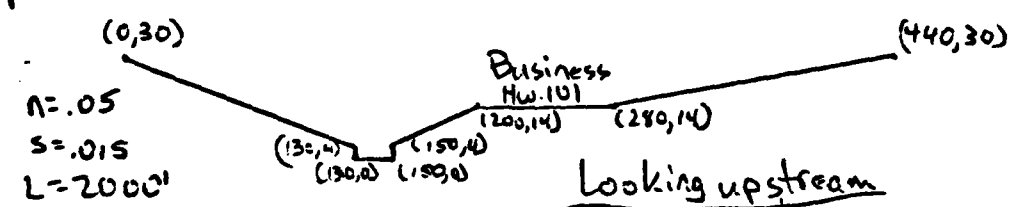
Stage (ft)	Area (above 10.2 ft) (sq ft)	Storage $\left(\frac{AREA \times 3200}{43{,}560}\right)$ (ac ft)	Q_{p2} (cfs)
27	3583	263	101,700
28	3920	288	99,500
29	4271	314	97,200



above the streambed, and a house about 21 ft. above the streambed. The bridge would be severely overtopped (9-10 ft), and flooding at the house would increase from none to 6-7 ft. This would present a threat of loss of life at this house.

In addition, there are a number of houses on Blood Brook slightly upstream of the confluence of Blood and Temple Brook which might be flooded by the backwater from dam failure flows. One house in particular is 8-10 ft. above the streambed and about 50 ft. upstream of the confluence. Other houses range from 8-20 ft. above the streambed and from 100 to 300 ft. upstream of the confluence.

Blood Brook continues through the village of West Wilton after it is joined by Temple Brook. The following typical cross-section for the 2000 ft. reach to the end of West Wilton is based on field notes and USGS topo information.



A Stage-Normal Flow relationship for this reach is given on p. 15. At the pre-failure flow of 7,500 cfs (assuming 2000

DEPTH	ELEV	AREA	WPER	HYD-R	AR2/3	Q
0.00	0.0	0.0	0.0	0.0	0.0	0.0
1.00	1.0	20.0	22.0	0.9	18.8	68.5
2.00	2.0	40.0	24.0	1.7	56.2	205.3
3.00	3.0	60.0	26.0	2.3	104.8	382.5
4.00	4.0	80.0	28.0	2.9	161.1	588.1
5.00	5.0	105.0	38.2	2.7	206.1	752.3
6.00	6.0	140.0	48.4	2.9	284.3	1037.7
7.00	7.0	185.0	58.6	3.2	398.3	1453.7
8.00	8.0	240.0	68.8	3.5	552.3	2015.7
9.00	9.0	305.0	79.0	3.9	751.0	2741.0
10.00	10.0	380.0	89.2	4.3	999.2	3646.8
11.00	11.0	465.0	99.4	4.7	1301.4	4750.0
12.00	12.0	560.0	109.6	5.1	1662.3	6067.1
13.00	13.0	665.0	119.8	5.6	2086.2	7614.1
14.00	14.0	780.0	130.0	6.0	2577.3	9406.5
15.00	15.0	987.5	225.1	4.4	2647.4	9662.4
16.00	16.0	1210.0	240.3	5.0	3556.9	12981.6
17.00	17.0	1447.5	255.4	5.7	4603.7	16802.2
18.00	18.0	1700.0	270.6	6.3	5791.9	21138.9
19.00	19.0	1967.5	285.7	6.9	7125.9	26007.6
20.00	20.0	2250.0	300.9	7.5	8610.1	31424.5
21.00	21.0	2547.5	316.0	8.1	10249.0	37406.1
22.00	22.0	2860.0	331.2	8.6	12047.2	43969.2
23.00	23.0	3187.5	346.3	9.2	14009.4	51130.7
24.00	24.0	3530.0	361.5	9.8	16140.1	58907.2
25.00	25.0	3887.5	376.6	10.3	18444.0	67315.7
26.00	26.0	4260.0	391.8	10.9	20925.5	76372.7
27.00	27.0	4647.5	406.9	11.4	23589.3	86094.8
28.00	28.0	5050.0	422.1	12.0	26439.8	96498.5
29.00	29.0	5467.5	437.2	12.5	29481.6	107600.2
30.00	30.0	5900.0	452.4	13.0	32719.0	119416.0

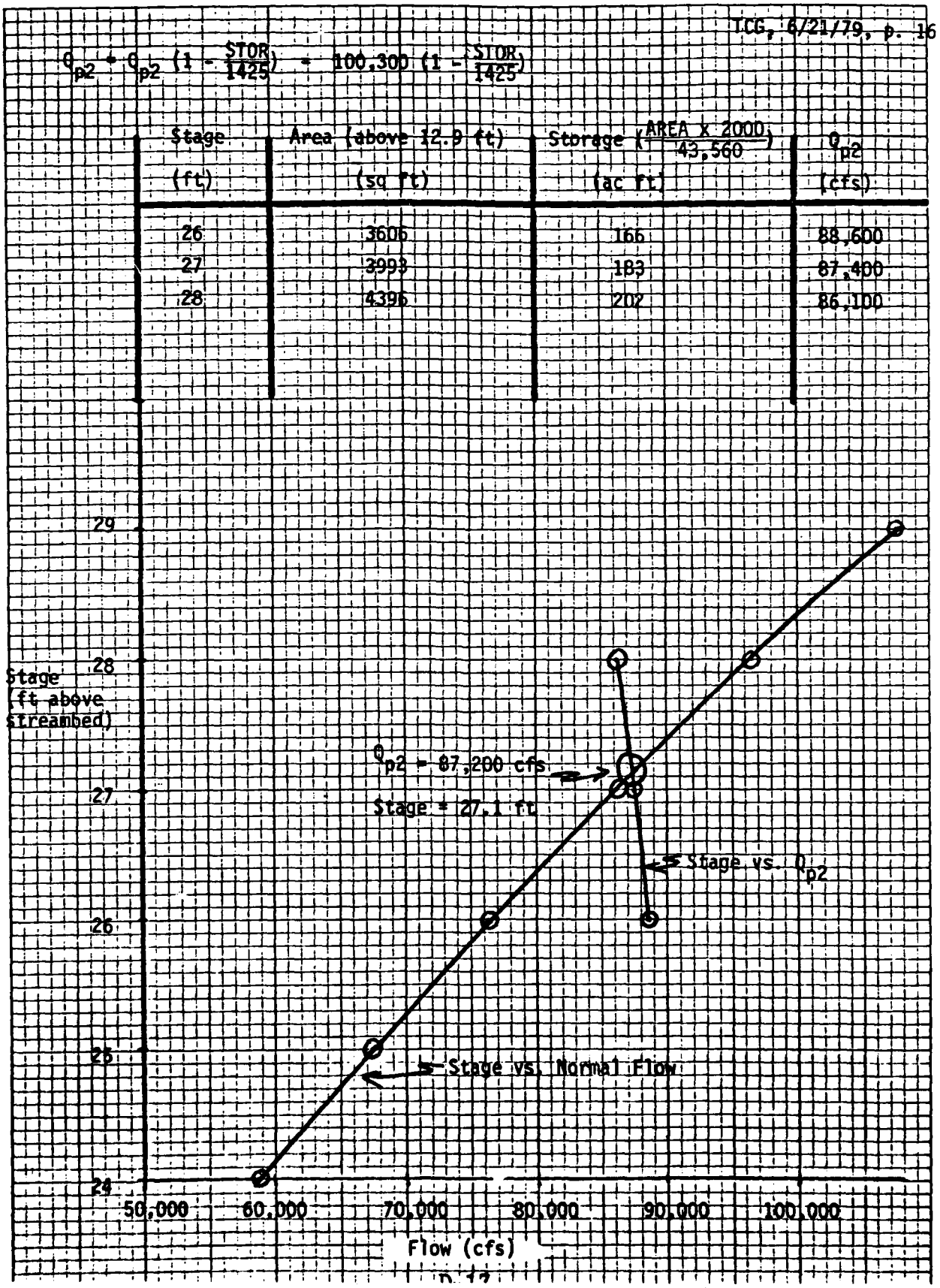
P.15

REACH FROM CONFLUENCE OF BLOOD & TEMPLE BKS. TO END OF WEST WILTON

Attenuated Peak Dam Failure Outflow at Downstream End of West Wilton

$$Q_{p2} + Q_{p2}\left(1 - \frac{STOR}{1425}\right) = 100{,}300\left(1 - \frac{STOR}{1425}\right)$$

Stage (ft)	Area (above 12.9 ft) (sq ft)	Storage $\left(\frac{AREA \times 2000}{43{,}560}\right)$ (ac ft)	Q_{p2} (cfs)
26	3606	166	88,600
27	3993	183	87,400
28	4396	202	86,100



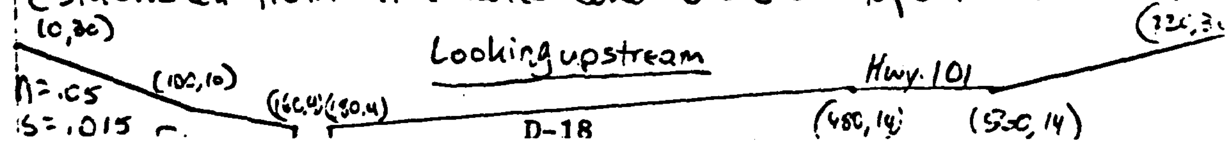
cfs of inflow from Blood Brook), the stage in this reach would be 12.9 ft. The attenuation due to storage in this reach is calculated on p. 16.

The attenuated peak dam failure flow at the downstream end of West Wilton is 87,200 cfs, which would create a stage of 27.1 ft. in the brook at this point.

The development along Blood Brook in this reach includes one group of 3 houses 10-15' above the streambed, and a gift shop an restaurant 15 ft. above the streambed. The pre-failure outflow of 7500 cfs would create about a foot of flooding at the restaurant and gift shop and slight (< 2.9 ft.) flooding at the houses.

The peak dam failure flow of 87,200 cfs would create 15 ft ± of flooding at the gift shop and restaurant, and 12-17 ft. at the houses. There would be high potential for loss of life in this area. Also, Business Highway 101, which parallels Blood Brook in this area, would be flooded 10-15 feet deep.

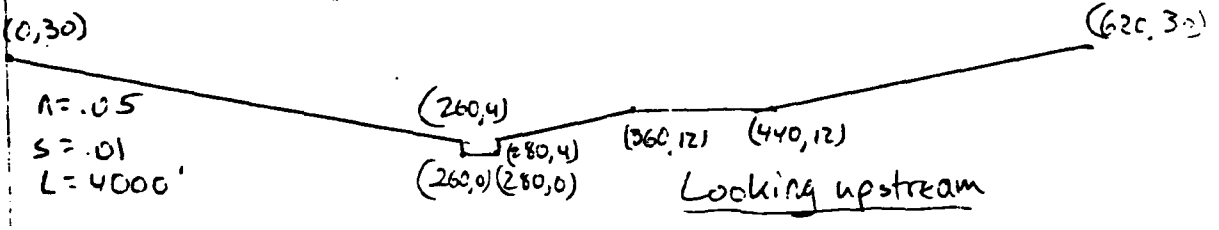
The next damage center downstream of West Wilton is a house 2000 ft. downstream on Blood Brook. The following typical cross-section for the reach was established from field notes and USGS topo information.



A Stage-Normal Flow relationship for this reach is given on p.19. At the pre-failure flow of 7500 cfs, there would be 9.9 ft. of flow in the brook. The attenuation due to storage in this reach is calculated on p. 20.

The peak dam failure flow of 76,100 cfs would create a stage of 14.2 feet in this reach. The house at the end of the reach is 10-15 ft. above the streambed, so dam failure would increase flooding from none to 4-9' at the house. Also, Highway 101, which parallels Blood Brook in this area, would be flooded.

The next hazard area downstream is a house at an abandoned mill and mill pond 4000' along Blood Brook. The following typical cross-section for the reach was established from field notes and USGS topo information



A Stage-Normal Flow relationship for this reach is given on p. 21. At the pre-failure flow of 7500 cfs, there would be 12.1 ft. of flow in the channel. The attenuation due to storage in this reach is calculated on p. 22.

The attenuated peak dam failure flow at the abandoned mill and mill pond is 59,000 cfs which would create a stage of 21.9 ft

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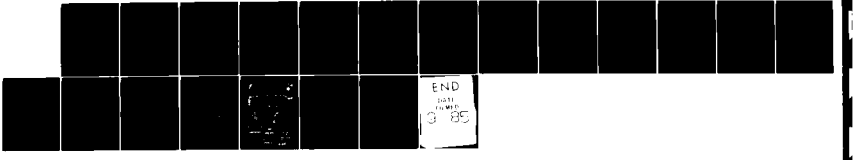

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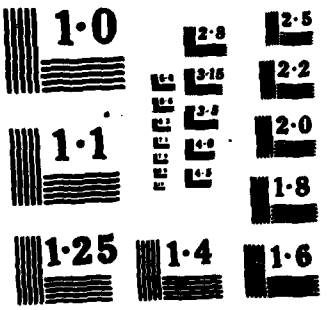

1·0
1·1
1·25
1·4
1·6
2·0
2·2
2·5

DEPTH	ELEV	AREA	WPER	HYD-R	AR2/3	Q
0.00	0.0	0.0	0.0	0.0	0.0	0.0
1.00	1.0	20.0	22.0	0.9	18.8	68.5
2.00	2.0	40.0	24.0	1.7	56.2	205.3
3.00	3.0	60.0	26.0	2.3	104.8	382.5
4.00	4.0	80.0	28.0	2.9	161.1	588.1
5.00	5.0	120.0	68.1	1.8	175.2	639.3
6.00	6.0	200.0	108.1	1.8	301.4	1100.1
7.00	7.0	320.0	148.2	2.2	534.7	1951.6
8.00	8.0	480.0	188.3	2.5	896.1	3270.5
9.00	9.0	680.0	228.3	3.0	1408.1	5139.1
10.00	10.0	920.0	268.4	3.4	2092.4	7636.6
11.00	11.0	1197.5	303.5	3.9	2991.4	10917.7
12.00	12.0	1510.0	338.6	4.5	4092.9	14937.9
13.00	13.0	1857.5	373.7	5.0	5412.5	19754.1
14.00	14.0	2240.0	408.9	5.5	6965.3	25421.6
15.00	15.0	2727.5	504.0	5.4	8411.9	30701.1
16.00	16.0	3230.0	519.2	6.2	10932.9	39902.2
17.00	17.0	3747.5	534.3	7.0	13740.1	50147.8
18.00	18.0	4280.0	549.5	7.8	16829.9	61424.6
19.00	19.0	4827.5	564.6	8.6	20200.0	73724.6
20.00	20.0	5390.0	579.8	9.3	23849.2	87043.5
21.00	21.0	5967.5	594.9	10.0	27777.3	101379.9
22.00	22.0	6560.0	610.1	10.8	31984.4	116734.8
23.00	23.0	7167.5	625.2	11.5	36471.4	133111.1
24.00	24.0	7790.0	640.4	12.2	41239.4	150513.0
25.00	25.0	8427.5	655.5	12.9	46289.9	168946.0
26.00	26.0	9080.0	670.6	13.5	51624.6	188416.4
27.00	27.0	9747.5	685.8	14.2	57245.6	208931.6
28.00	28.0	10430.0	700.9	14.9	63155.1	230499.5
29.00	29.0	11127.5	716.1	15.5	69355.2	253128.5
30.00	30.0	11840.0	731.2	16.2	75848.6	276827.7

REACH FROM WEST WILTON TO HOUSE 2000 FT. DOWNSTREAM

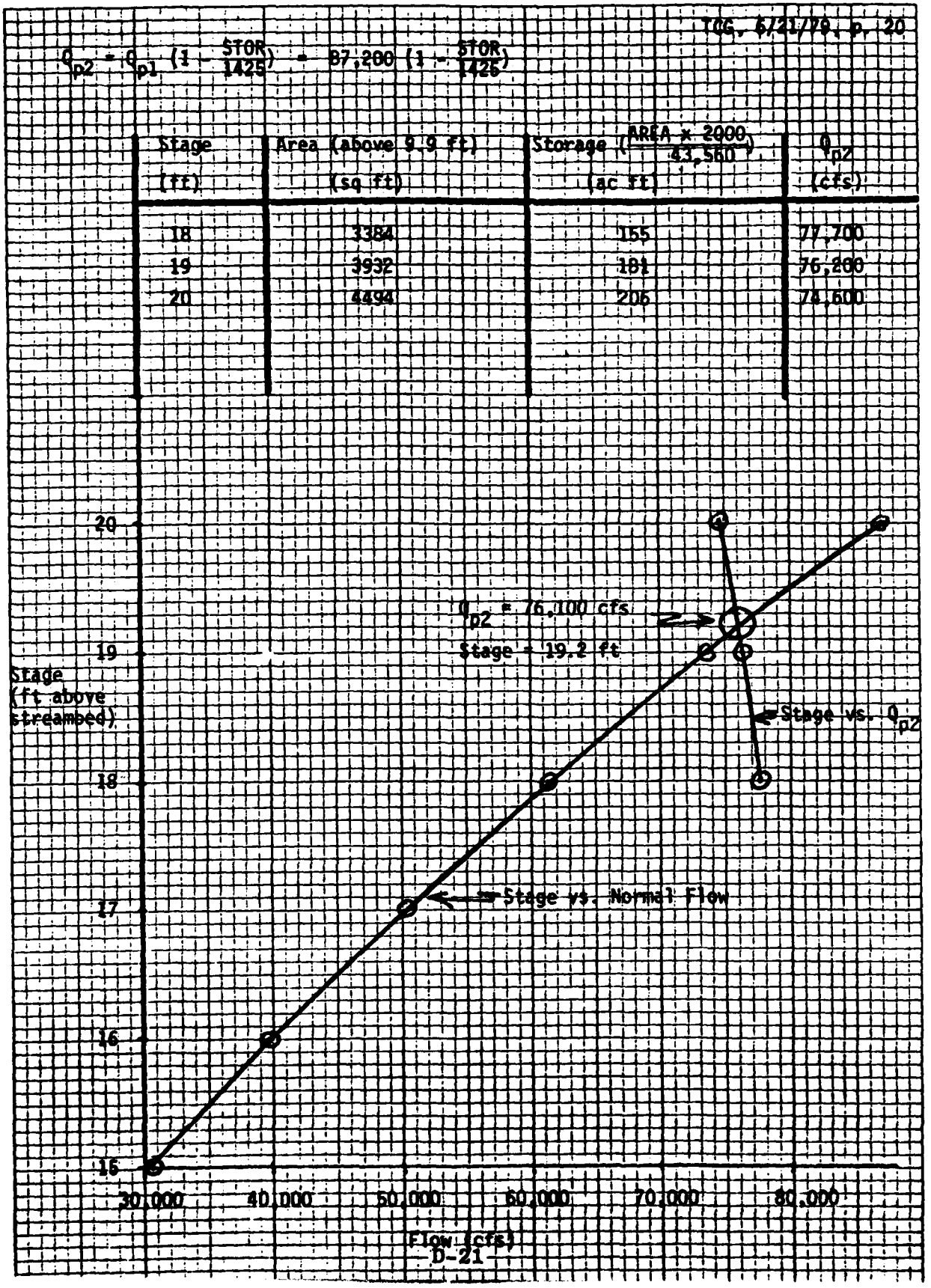
P.19

Attenuated Peak Dam Failure Flow at House 2000 ft Downstream of West Wilton

TOG, 6/21/79, p. 20

$$Q_{p2} = Q_{p1}\left(1 - \frac{STOR}{1425}\right) = 87{,}200\left(1 - \frac{STOR}{1425}\right)$$

Stage (ft)	Area (above 9.9 ft) (sq ft)	Storage $\left(\frac{AREA \times 2000}{43{,}560}\right)$ (ac ft)	Q_{p2} (cfs)
18	3384	155	77,700
19	3932	181	76,200
20	4494	206	74,600

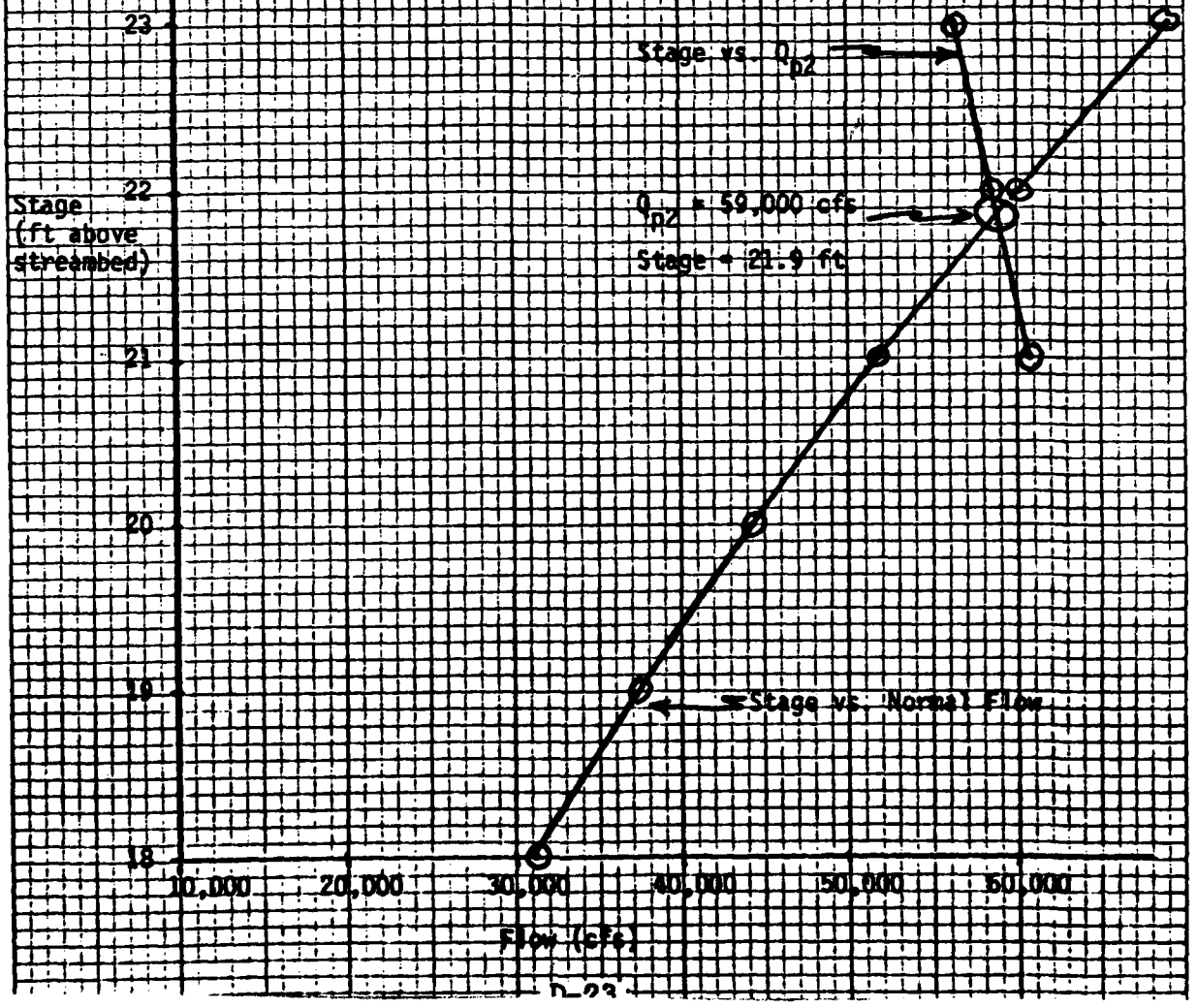


DEPTH	ELEV	AREA	WPER	HYD-R	AR2/3	Q
0.00	0.0	0.0	0.0	0.0	0.0	0.0
1.00	1.0	20.0	22.0	0.9	18.8	55.9
2.00	2.0	40.0	24.0	1.7	56.2	167.6
3.00	3.0	60.0	26.0	2.3	104.8	312.3
4.00	4.0	80.0	28.0	2.9	161.1	480.2
5.00	5.0	110.0	48.1	2.3	191.0	569.2
6.00	6.0	160.0	68.2	2.3	282.6	842.1
7.00	7.0	230.0	88.3	2.6	435.6	1298.0
8.00	8.0	320.0	108.4	3.0	658.8	1963.1
9.00	9.0	430.0	128.5	3.3	962.4	2868.0
10.00	10.0	560.0	148.6	3.8	1356.7	4043.1
11.00	11.0	710.0	168.7	4.2	1851.7	5518.0
12.00	12.0	880.0	188.8	4.7	2456.8	7321.1
13.00	13.0	1150.0	288.9	4.0	2889.8	8611.6
14.00	14.0	1440.0	309.0	4.7	4019.7	11978.6
15.00	15.0	1750.0	329.1	5.3	5334.4	15896.6
16.00	16.0	2080.0	349.2	6.0	6838.9	20379.8
17.00	17.0	2430.0	369.3	6.6	8538.2	25443.8
18.00	18.0	2800.0	389.4	7.2	10438.1	31105.5
19.00	19.0	3190.0	409.5	7.8	12544.4	37382.2
20.00	20.0	3600.0	429.6	8.4	14863.0	44291.6
21.00	21.0	4030.0	449.7	9.0	17399.9	51851.7
22.00	22.0	4480.0	469.8	9.5	20161.2	60080.5
23.00	23.0	4950.0	489.9	10.1	23153.0	68996.1
24.00	24.0	5440.0	510.0	10.7	26381.3	78616.4
25.00	25.0	5950.0	530.1	11.2	29852.2	88959.5
26.00	26.0	6480.0	550.2	11.8	33571.5	100043.2
27.00	27.0	7030.0	570.3	12.3	37545.4	111885.2
28.00	28.0	7600.0	590.4	12.9	41779.6	124503.3
29.00	29.0	8190.0	610.5	13.4	46280.2	137914.9
30.00	30.0	8800.0	630.6	14.0	51052.8	152137.4

REACH FROM HOUSE 2000 FT. D/S OF WEST WILTON TO ABANDONED MILL

$$Q_{p2} = Q_{p1}\left(1 - \frac{STOR}{1425}\right) = 76{,}100\left(1 - \frac{STOR}{1425}\right)$$

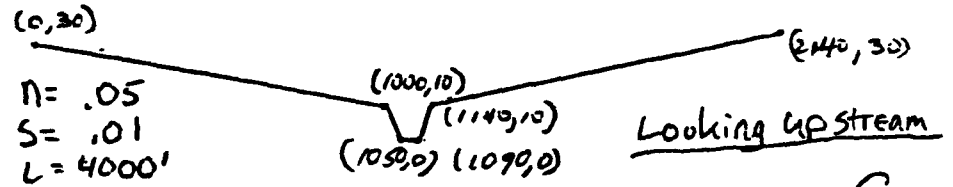
Stage (ft)	Area (above 12.1 ft) (sq ft)	Storage $\left(\frac{AREA \times 4000}{43{,}560}\right)$ (ac ft)	Q_{p2} (cfs)
21	3123	287	60,800
22	3573	328	58,600
23	4043	371	56,300



The house near the abandoned mill is 15 ft. above the streambed, on the far side of Highway 101. The pre-failure stage of 12.1 ft. is about at highway level.

The peak dam failure outflow of 59,600 cfs would create a stage of 21.9 ft., causing 7 ft. of flooding at the house, and 10 ft on Highway 101. This would present a threat of loss of life.

The next damage center is the Highway 31 bridge across Blood Brook. (A sign on the bridge identifies the stream as Gambol Brook). The following typical section for the 4000 ft. reach to the bridge was established from field notes and USGS topo information.



A Stage-Normal Flow relationship for this reach is given on p. 24. At the pre-failure flow of 7500 cfs, there would be 9.1 ft. of flow in the channel. The attenuation due to storage in this reach is calculated on p. 25

The attenuated peak dam failure flow would be 43,900 cfs, which would create a stage of about 17.5 ft. in Blood Brook.

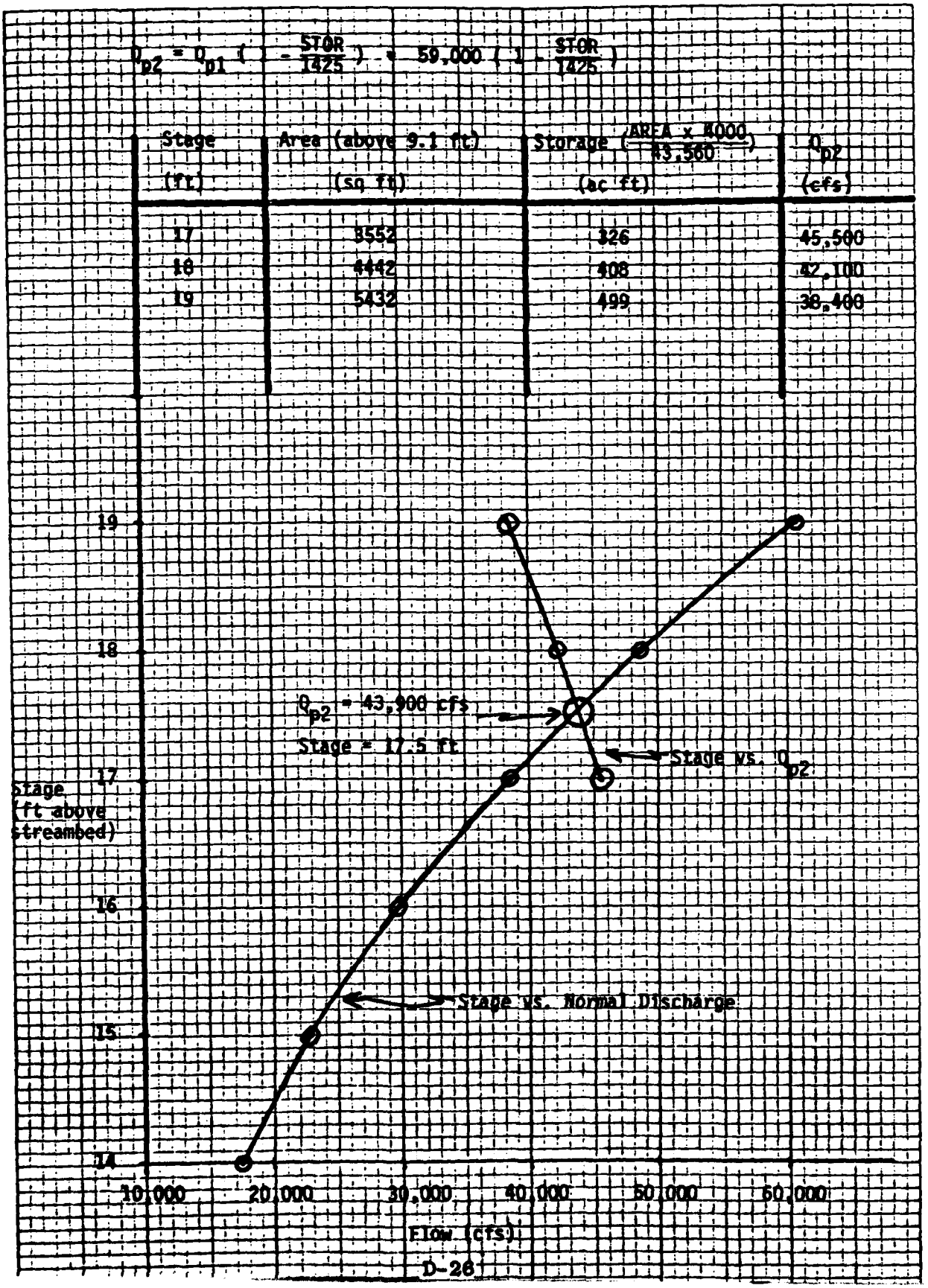
The low chord of the Highway 31 bridge is about 15 ft. above the stream bed. It would probably be overtopped by the dam failure flow. There are a junkyard 15 ft

DEPTH	ELEV	AREA	WPER	HYD-R	AR2/3	Q
0.00	0.0	0.0	0.0	0.0	0.0	0.0
1.00	1.0	45.0	50.2	0.9	41.8	124.7
2.00	2.0	100.0	60.4	1.7	140.0	417.1
3.00	3.0	165.0	70.6	2.3	290.7	866.2
4.00	4.0	240.0	80.8	3.0	496.1	1478.5
5.00	5.0	325.0	91.0	3.6	759.7	2264.0
6.00	6.0	420.0	101.2	4.2	1085.3	3234.1
7.00	7.0	525.0	111.4	4.7	1476.6	4400.3
8.00	8.0	640.0	121.6	5.3	1937.7	5774.4
9.00	9.0	765.0	131.8	5.8	2472.4	7367.8
10.00	10.0	900.0	142.0	6.3	3084.5	9191.8
11.00	11.0	1090.0	242.0	4.5	2974.3	8863.4
12.00	12.0	1380.0	342.0	4.0	3499.2	10427.5
13.00	13.0	1770.0	442.0	4.0	4465.3	13306.5
14.00	14.0	2260.0	542.1	4.2	5857.2	17454.4
15.00	15.0	2850.0	642.1	4.4	7701.3	22949.9
16.00	16.0	3540.0	742.1	4.8	10036.7	29909.3
17.00	17.0	4330.0	842.1	5.1	12906.3	38460.7
18.00	18.0	5220.0	942.1	5.5	16353.9	48734.7
19.00	19.0	6210.0	1042.2	6.0	20423.1	60860.8
20.00	20.0	7300.0	1142.2	6.4	25156.5	74966.4
21.00	21.0	8490.0	1242.2	6.8	30595.9	91175.8
22.00	22.0	9780.0	1342.2	7.3	36782.1	109610.6
23.00	23.0	11170.0	1442.2	7.7	43754.9	130389.6
24.00	24.0	12660.0	1542.3	8.2	51553.2	153628.6
25.00	25.0	14250.0	1642.3	8.7	60215.2	179441.3
26.00	26.0	15940.0	1742.3	9.1	69778.1	207938.7
27.00	27.0	17730.0	1842.3	9.6	80278.4	239229.7
28.00	28.0	19620.0	1942.3	10.1	91752.1	273421.4
29.00	29.0	21610.0	2042.4	10.6	104234.4	310618.6
30.00	30.0	23700.0	2142.4	11.1	117759.9	350924.5

REACH FROM ABANDONED MILL TO HIGHWAY 31 BRIDGE

$$Q_{p2} = Q_{p1}\left(1 - \frac{STOR}{1425}\right) + 59{,}000\left(1 - \frac{STOR}{1425}\right)$$

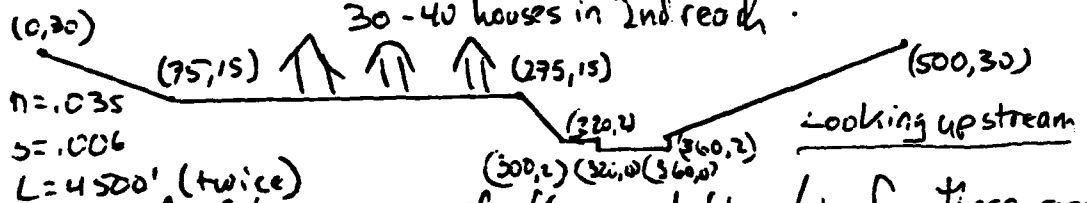
Stage (ft)	Area (above 9.1 ft) (sq ft)	Storage $\left(\frac{AREA \times 4000}{43{,}560}\right)$ (ac ft)	Q_{p2} (cfs)
17	8552	326	45,500
18	4442	408	42,100
19	5432	499	38,400



above the stream bed and 3 houses 20 ft. up at this point. The junkyard would receive some flooding, but the houses would not.

About 800 ft. downstream of the Highway 31 Bridge, Blood Brook enters the Souhegan River. The peak dam failure flow of 43,900 cfs would not be significantly attenuated in this reach, nor is there any development to be affected by dam failure flows.

The Souhegan River runs 4500 ft. from Blood Brook to the beginning of a group of 30-40 houses 15 ft. above the streambed. These houses are along the river for the next 4500 ft. until Rte. 101 crosses the Souhegan. The following cross-section is typical for both 4500' reaches, and is based on field notes and USGS topo information.



A stage-normal flow relationship for these reaches given on p. 27. The pre-failure flow of 12,500 cfs (assuming 5000 cfs inflow from the Souhegan) would create a stage of 11.8 ft. in the two reaches. The attenuation by storage in the first reach is calculated on p. 28.

The attenuated peak outflow of 37,700 cfs would yield

DEPTH	ELEV	AREA	WPER	HYD-R	AR2/3	Q
0.00	0.0	0.0	0.0	0.0	0.0	0.0
1.00	1.0	40.0	42.0	1.0	38.7	127.7
2.00	2.0	80.0	44.0	1.8	119.2	393.1
3.00	3.0	143.5	71.3	2.0	228.8	754.4
4.00	4.0	213.8	78.5	2.7	417.1	1375.5
5.00	5.0	291.2	85.8	3.4	657.7	2169.0
6.00	6.0	375.4	93.1	4.0	951.6	3138.1
7.00	7.0	466.5	100.3	4.6	1300.4	4288.1
8.00	8.0	564.6	107.6	5.2	1705.9	5625.3
9.00	9.0	669.6	114.9	5.8	2170.2	7156.4
10.00	10.0	781.5	122.1	6.4	2695.5	8888.4
11.00	11.0	900.4	129.4	7.0	3283.8	10828.5
12.00	12.0	1026.2	136.7	7.5	3937.4	12983.8
13.00	13.0	1158.8	143.9	8.1	4658.4	15361.5
14.00	14.0	1298.5	151.2	8.6	5449.1	17968.9
15.00	15.0	1445.0	158.5	9.1	6311.7	20813.1
16.00	16.0	1800.0	368.7	4.9	5183.2	17091.9
17.00	17.0	2165.0	378.9	5.7	6924.1	22832.6
18.00	18.0	2540.0	389.1	6.5	8878.0	29276.0
19.00	19.0	2925.0	399.3	7.3	11040.7	36407.4
20.00	20.0	3320.0	409.5	8.1	13409.0	44217.0
21.00	21.0	3725.0	419.7	8.9	15980.8	52697.9
22.00	22.0	4140.0	429.9	9.6	18755.0	61845.8
23.00	23.0	4565.0	440.0	10.4	21730.6	71658.2
24.00	24.0	5000.0	450.2	11.1	24907.5	82134.3
25.00	25.0	5445.0	460.4	11.8	28285.8	93274.4
26.00	26.0	5900.0	470.6	12.5	31865.8	105079.6
27.00	27.0	6365.0	480.8	13.2	35648.1	117552.1
28.00	28.0	6840.0	491.0	13.9	39633.6	130694.6
29.00	29.0	7325.0	501.2	14.6	43823.3	144510.3
30.00	30.0	7820.0	511.4	15.3	48218.3	159003.2

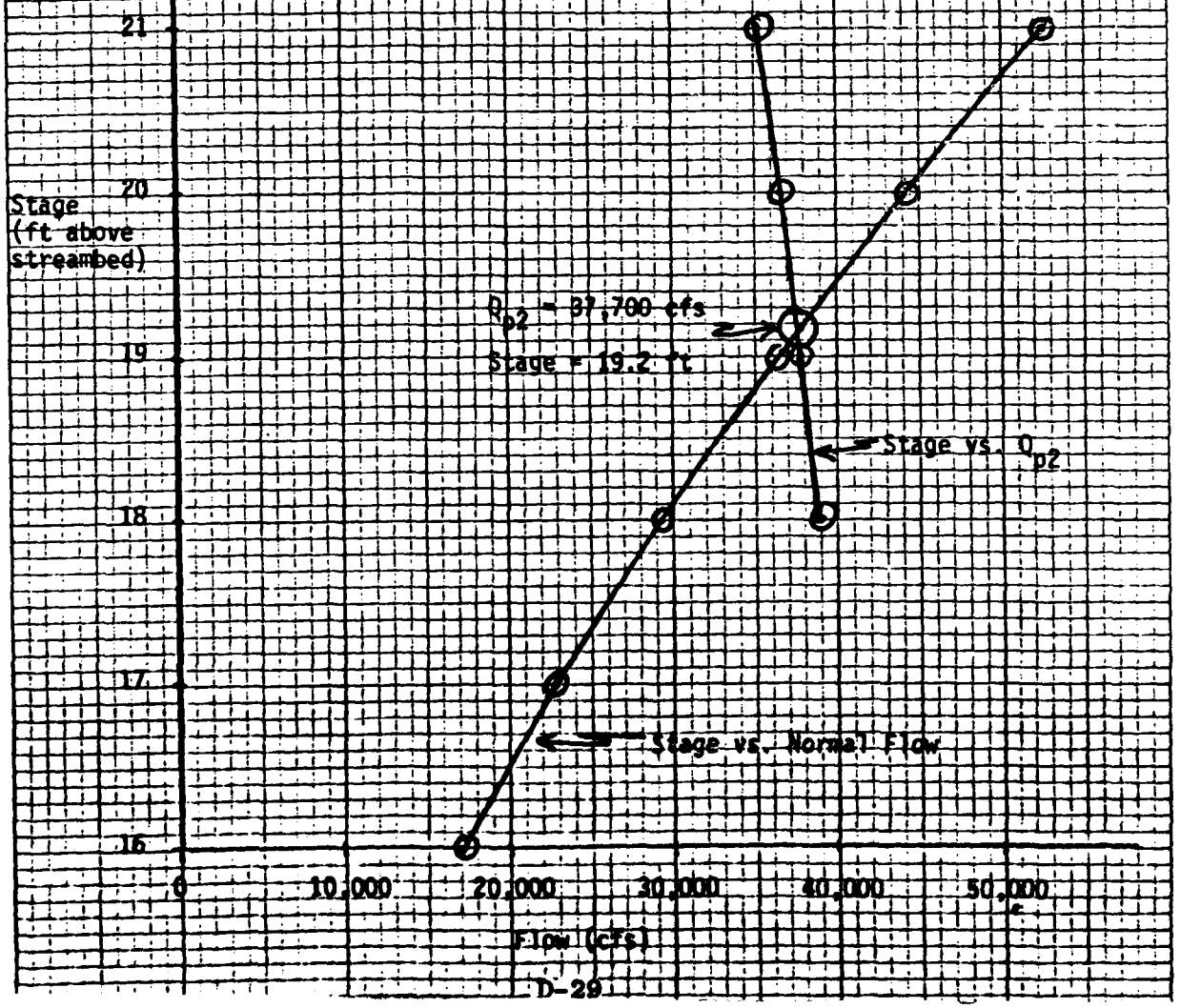
REACH ON THE SOUHEGAN FROM BLOOD BROOK TO THE ROUTE 101 BRIDGE

Attenuated Peak Failure Flow at Upstream End of Houses on Souhegan

TCG, 6/21/79, p. 28

$$Q_{p2} = Q_{p1}\left(1 - \frac{STOR}{1425}\right) = 43{,}900\left(1 - \frac{STOR}{1425}\right)$$

Stage (ft)	Area (above 11.6 ft) (sq ft)	Storage $\left(\frac{AREA \times 4500}{43{,}560}\right)$ (ac ft)	Q_{p2} (cfs)
18	1539	159	39,000
19	1924	199	37,800
20	2319	240	36,500
21	2724	281	35,200



a stage of 19.2 ft. There is no development in this reach except a secondary road which crosses the Souhegan on a bridge. This road and bridge might be damaged by dam failure flows.

The attenuation by storage in the second reach, from the beginning of the development to the Highway 101 bridge, is calculated on p. 30.

The attenuated peak failure flow of 33,000 cfs would yield a stage of 18.5 ft. Thus stage in this reach ranges from 19.2 - 18.5 ft, creating about 4 feet of flooding at the houses. This would cause significant damage, and present a threat of loss of life. Also, the Highway 101 Bridge across the Souhegan has a low chord about 15 ft. above the streambed, and would be overtopped by dam failure flows.

Downstream of the Highway 101 bridge the Souhegan proceeds about 6000 ft. to the town of Wilton. The flow would be further attenuated in this reach, but would probably cause flooding in the town, where 10-15 houses and factories are near the river. Downstream of Wilton, the river runs through about 5 miles of broad, flat floodplain to Milford. This reach would probably attenuate dam failure flows.

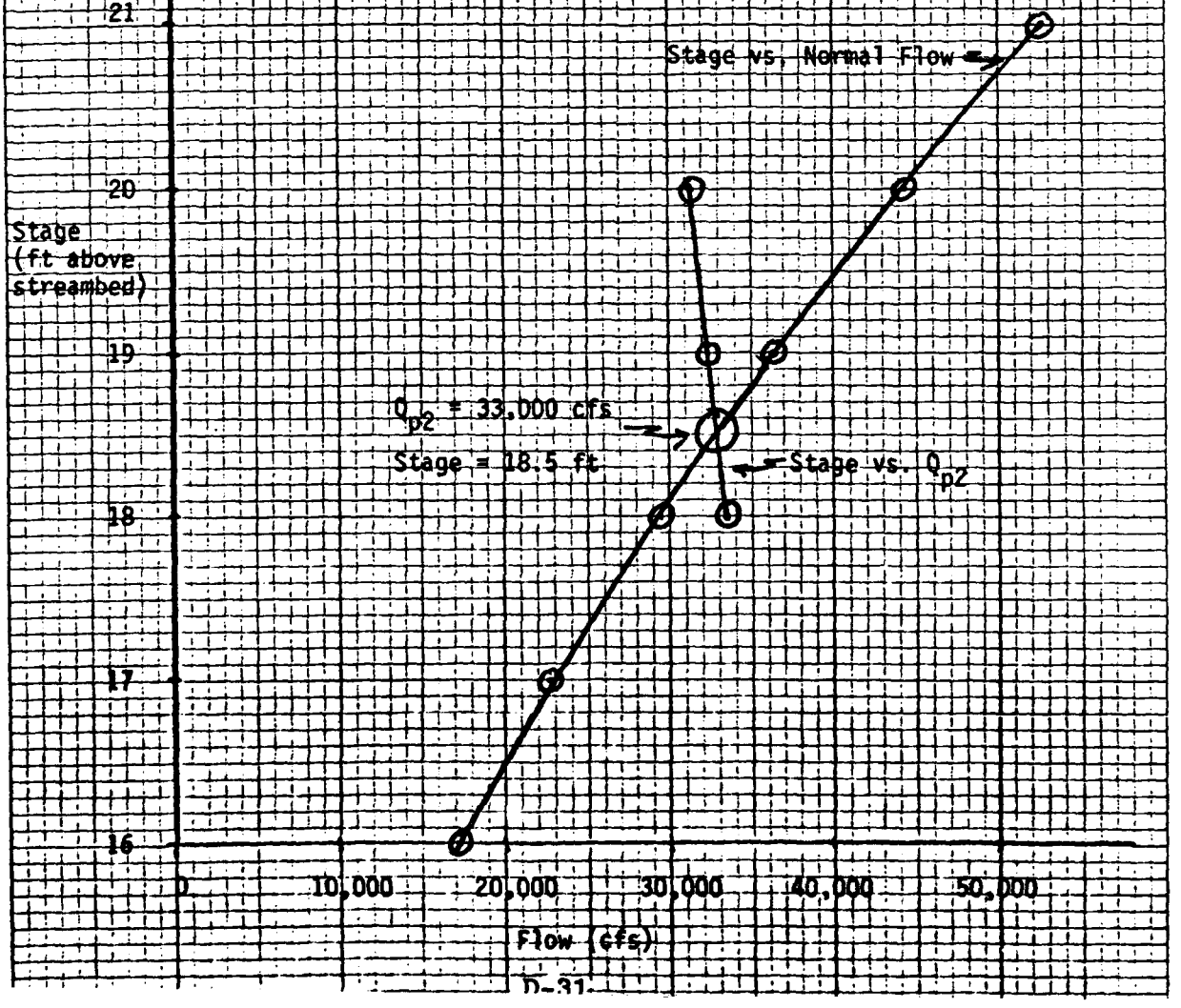
The chart on the D-30 page 31 summarizes the effects

Attenuated Peak Dam Failure Outflow at the Highway 101 Bridge on the Souhegan

TCG, 6/21/79, p. 30

$$Q_{p2} = Q_{p1}\left(1 - \frac{STOR}{1425}\right) = 37{,}700\left(1 - \frac{STOR}{1425}\right)$$

Stage (ft)	Area (above 11.8 ft) (sq ft)	Storage $\left(\frac{AREA \times 4500}{43{,}560}\right)$ (ac ft)	Q_{p2} (cfs)
18	1539	159	33,500
19	1924	199	32,400
20	2319	240	31,400



10 X 10 PER INCH

19.3 Dam safety Southegan R. W. Dam # 25-B [illegible]

of the failure of Southegan River Watershed Dam # 25-B

Location # (map p 6)	Location	# of dwellings	level above streambed (ft)	Flow and Stage before failure	Flow and Stage after failure	Comments
—	at dam	—	—	5500 cfs	165,500 cfs	
①	confluence, Blood & Temple Brks.	1 8 u/s on Blood Brook	21 8-20	5500 cfs 10.2 ft.	100,300 cfs 27.6 ft.	danger of loss of life
①	West Wilton d/s of confluence	3 houses 1 restaurant 1 gift shop	10-15 12 12	7500 cfs 12.9 ft.	87,000 cfs 27.1 ft.	danger of loss of life. Also floods Rte. 101
②	House, 2000' d/s of West Wilton	1	10-15	7500 cfs 9.9 ft.	76,100 cfs 19.2 ft.	danger of loss of life. Also floods Rte 101
③	House @ abandoned Mill	1	15	7500 cfs 12.1 ft.	59,000 cfs 21.9 ft.	danger of loss of life. Also floods Rte. 101.
④	Highway 31 Bridge	1 junkyard 3 houses	15 20	7500 cfs 9.1 ft.	43,900 cfs 17.6 ft.	Rte. 31 Bridge over-topped
⑤	Confluence with Southegan River	—	—	7,500 cfs —	43,900 cfs —	—
	4500'-9000' d/s on Southegan	30-40	15 ±	12,500 cfs 11.8 ft.	33,000-37,700 19 ft ±	Danger of loss of life
—	Wilton	10-15	varies	12,500 cfs —	— —	—

Test Flood Analysis

Size Classification: Intermediate

Hazard Classification: High

The hazard classification is HIGH due to the potential for serious economic losses and loss of life at numerous locations downstream of the dam in the event of dam failure. (See chart, p. 31)

Test Flood: PMF

Using the COE NED "Maximum Probable Flood Peak Flow Rates," the drainage area of 5.4 sq. miles would yield a PMF peak inflow of 1830 csm with rolling terrain, and 2190 csm with mountainous terrain. Since the terrain is somewhere between rolling & mountainous, we will use 2000 csm.

Peak inflow = 5.4(2000) = 10,800 cfs

The SCS "Freeboard Hydrograph" for this dam, which is approximately equivalent to the PMF, has a peak inflow of 10,100 cfs. (P. 31, SCS "Hydrology and Hydraulics" Design Calculations.) Since the COE PMF peak inflow is larger (and therefore more conservative), the test flood is 10,800 cfs.

The attenuation of this peak inflow will use a

Starting water surface elevation of 772.2 ft MSL (h = 11.7), which is reached after six days of drawdown from the emergency spillway crest. The attenuation due to storage is calculated on p. 34. The attenuated peak outflow using COE simplified methodology is 8150 cfs. This contrasts with the SCS "Freeboard Hydrograph peak outflow of 9,660 cfs, which was determined by a storage routing through the reservoir. This yields a peak water surface elevation 807.4 ft MSL, h = 46.9 ft, 1.6 ft below the dam crest.

Since the SCS methodology results in a more conservative test flood we will use:

peak inflow = 10,100 cfs = 1870 csm
peak outflow = 9,660 cfs
peak stage = 807.4 ft. MSL, 1.6 ft below dam crest

as our test flood.

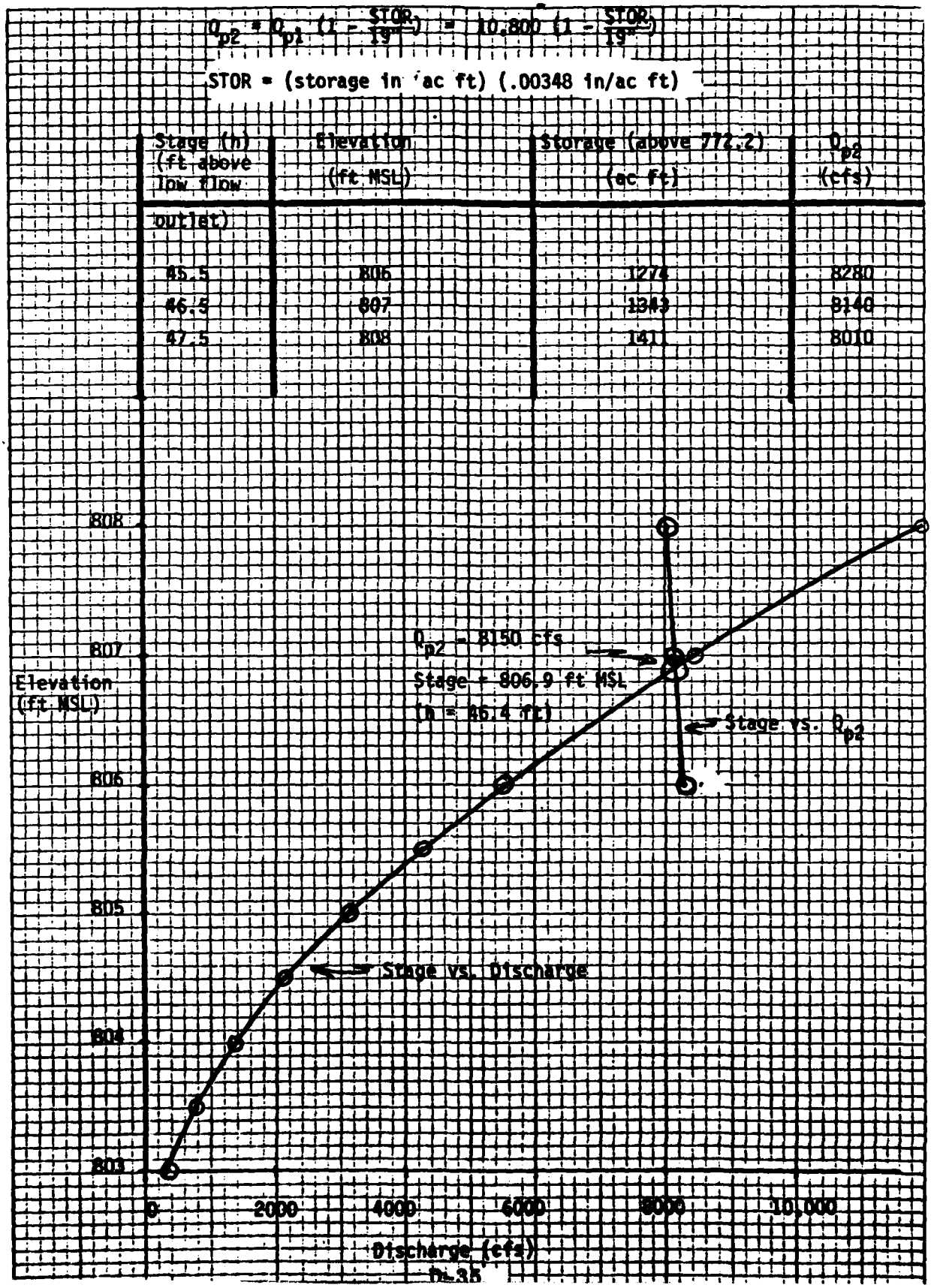
Drawdown Time

According to pp 25-26 of the SCS "Hydrology and Hydraulics" Design Calculations, 8.8 days are required for the reservoir to draw down from the emergency spillway crest to normal pool, 760.5' MSL. Elevation 772.2' MSL is reached in 6 days.

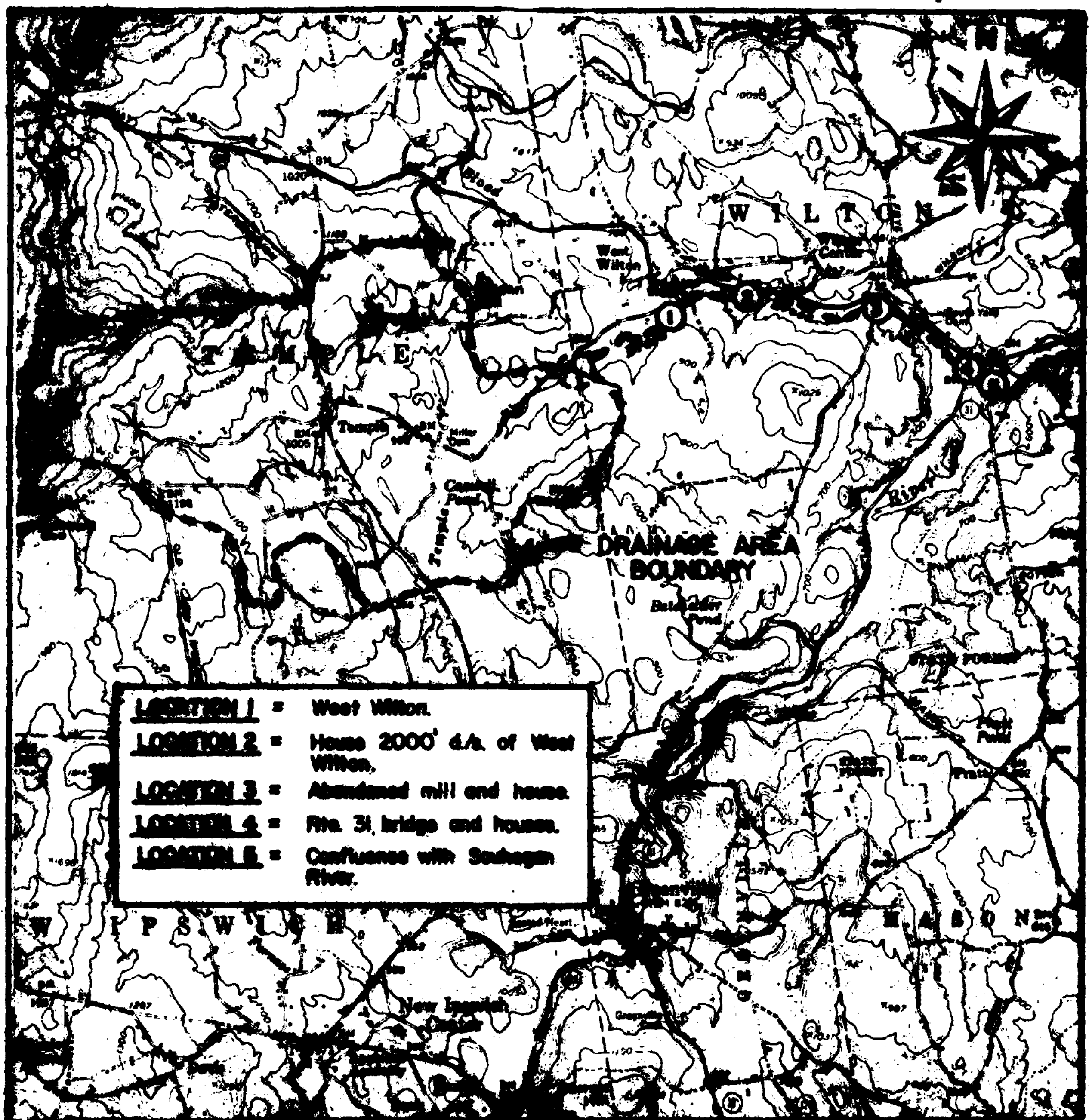
$$Q_{p2} = Q_{p1}\left(1 - \frac{STOR}{19^{**}}\right) = 10{,}800\left(1 - \frac{STOR}{19^{**}}\right)$$

STOR = (storage in ac ft) (.00348 in/ac ft)

Stage (h) (ft above low flow outlet)	Elevation (ft MSL)	Storage (above 772.2) (ac ft)	Q_{p2} (cfs)
45.5	806	1274	8280
46.5	807	1343	8140
47.5	808	1411	8010



h.35



– SCALE –

0 1/2 1 2 (miles)

FROM: USGS PETERBOROUGH – N.H. QUADRANGLE MAPS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

LOCATION AND DOWNSTREAM HAZARD MAP

SOUHEGAN RIVER

NEW HAMPSHIRE

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

STATE	IDENTITY NUMBER	DIVISION	STATE	COUNTY	CONGR DIST.	STATE	COUNTY	CONGR DIST.	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE DAY | MO | YR
NH	476	NED	NH	011	02				SOUHEGAN RIVER WATERSHED DAM NO 25B	4249.3	7149.2	30JUL79

POPULAR NAME	NAME OF IMPOUNDMENT

REGION	BASIN	RIVER OR STREAM	NEAREST DOWNSTREAM CITY-TOWN-VILLAGE	DIST FROM DAM (MI.)	POPULATION
01	05	TEMPLE BROOK	WILTON	1	2276

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STRUCTURAL HEIGHT (FT.)	HYDRAULIC HEIGHT (FT.)	IMPOUNDING CAPACITIES MAXIMUM (ACRE-FT.)	IMPOUNDING CAPACITIES NORMAL (ACRE-FT.)	DIST	OWN	FED R	PRV/FED	SCS A	VER/DATE
PGRE	1971	C	69	60	1623	36	NED	N	N	N	B	

REMARKS

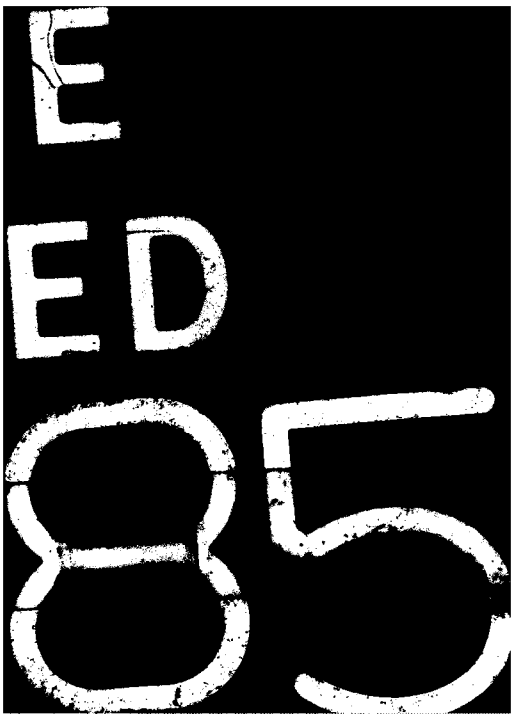
D/S HAS	SPILLWAY CREST LENGTH	SPILLWAY TYPE	SPILLWAY WIDTH (FT.)	MAXIMUM DISCHARGE (FT.)	VOLUME OF DAM (CY)	POWER CAPACITY INSTALLED (MW)	POWER CAPACITY PROPOSED (MW)	NAVIGATION LOCKS NO.	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)
1	695	U	350	15482	194300											

OWNER	ENGINEERING BY	CONSTRUCTION BY
NH WATER RESOURCES BOARD	USDA SCS	

REGULATORY AGENCY			
DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONE	NONE	NONE	NONE

INSPECTION BY	INSPECTION DATE DAY | MO | YR	AUTHORITY FOR INSPECTION
GOLDBERG ZOINO DUNNICLIFF & ASSOC	14MAY79	PUBLIC LAW 92-367

REMARKS


E
ED
85